Investigating the Capital Structure of South African JSE listed IT firms: a National and International Comparative Study.

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DECLARATION

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I, Andrew Victor, do hereby certify that this dissertation submitted to the University of South Africa, Pretoria, is my own work and all the sources that I have used have been cited and acknowledged by means of complete references.

Signed: Andrew Victor **Date: 24 August 2018**

Abstract

This study is aimed at investigating the capital structures of the Johannesburg Stock Exchange listed South African IT firms and compare these to the capital structures of NASDAQ listed US IT firms in order to better understand the capital structures that JSE listed South African firms employ. The study made use of secondary data in the form of ratio analysis from public sources, as well as the published annual financial statements of the firms. The Generalised Method of Moments regression analysis technique was used in order to test the data for relationships between certain ratios. The study found positive relationships between the firm's capital structure and its return on equity; meaning that firms should make use of their capital structures to maximise their return on equity and as a result, returns for its shareholders.

Keywords: Capital structure, Debt Ratio, Return on Equity, Generalised Methods of Moments

Opsomming

Hierdie studie is daarop gerig om die kapitaalstrukture van Suid-Afrikaanse IT-ondernemings wat op die Johannesburgse Aandelebeurs (JSE) genoteer is te ondersoek, en dit te vergelyk met die kapitaalstrukture van NASDAQ-genoteerde Amerikaanse IT-ondernemings ten einde die kapitaalstrukture wat JSE-genoteerde Suid-Afrikaanse ondernemings gebruik, beter te verstaan. Die studie het sekondêre data in die vorm van verhoudingsontleding uit openbare bronne, asook die gepubliseerde finansiële jaarstate van die ondernemings gebruik. Die Veralgemeende Metode van Momente-regressieanalisetegniek is gebruik ten einde die data vir verwantskappe tussen bepaalde verhoudings te toets. Die studie het positiewe verwantskappe tussen die ondernemings se kapitaalstruktuur en opbrengs op ekwiteit gevind; dit beteken dat ondernemings hul kapitaalstrukture behoort te gebruik om hul opbrengs op ekwiteit en gevolglik ook opbrengste vir hul aandeelhouers te maksimeer.

Ingqikithi Yocwaningo

Lolu cwaningo kuhloswe ngalo ukuhlola izinhlaka ezifaka imali ezinkampanini zobuchwephese bamakhompuyutha ezisohlwini lwe-Johannesburg Stock Exchange (i-JSE), nokuziqhathanisa nezinhlaka ezifaka imali ezinkampanini zase-US zobuchwepheshe bekhompuyutha ezisohlwini lwe-NASDAQ ukuze kuqondakale kangcono izinhlaka ezifaka imali ezinkampanini zaseNingizimu Afrika ezisohlwini lwe-JSE. Lolu cwaningo lusebenzise imininingwane eqoqwe kweminye emayelana nokucwaningwa kwezinombolo etholakala emithonjeni evulelekile emalungwini omphakathi kanye nakwizitatimende zezezimali zonyaka zezinkampani. Kusetshenziswe indlela yokucwaninga ehlawumbiselayo ngokuqhathanisa ubudlelwano neyaziwa ngokuthi yi-*Generalised Method of Moments*, ukuze kuhlolwe imininingwane eveza ubudlelwano phakathi kwezinombolo ezithile. Ucwaningo luthole ubudlelwano obubonakalayo phakathi kwezinhlaka ezifaka imali enkampanini kanye nenzuzo yayo yamanani amasheya; okusho ukuthi izinkampani kumele zisebenzise izinhlaka zazo ezizifakela imali ukwandisa amathuba enzuzo yamanani amasheya okuyinto ezodala ukuba kuhlomule abanini-bamasheya.

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List of acronyms

AT	Asset Tangibility
EBIT	Earnings before Interest and Taxes
EPS	Earnings per share
FS	Firm Size
GDP	Gross domestic product
IT	Information Technology
JSE	Johannesburg Stock Exchange
LTDTD	Long Term Debt as a percentage of Total Debt
NASDAQ	National Association of Securities Dealers Automated Quotations
NDTS	Non Debt Tax Shields
ROA	Return on Assets
ROE	Return on Equity
SA	South Africa
TD	Total Debt
TIE	Times interest Earned
UK	United Kingdom
USA	United States of America
WACC	Weighted Average Cost of Capital
DCF	Discounted Cash Flow
TL	Total Liabilities
TA	Total Assets
DR	Debt Ratio
LTD	Long Term Debt
NI	Net Income
TE	Total Equity
ASO	Average Stock Outstanding
IE	Interest Expense
NDTS	Non Debt Tax Shields

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Chapter One: Introduction

1.1 Background of the Study

Myers (1984), in his paper titled: "The Capital Structure Puzzle", verbalises the question that has been plaguing financial professionals since the development of modern finance practices: "How do firms choose their capital structures?" Myers (1984) concludes that despite the numerous research studies that have been conducted we still do not have definitive answers as to how or why firms choose the capital structures that they employ. Over the years, many attempts have been made to understand the capital structures employed by firms, what impact capital structures have on the performance of the firm, and how these capital structures translate into wealth maximisation for the shareholders. Auerbach (1979: 433) in an attempt to further understand and explain capital structures went a step further than the "how" of a firm's capital structure by attempting to address the "why", stating:

> In a simple world of certainty, with perfect capital markets, no taxes on capital income, and all investment financed through direct ownership, a utility-maximising investor would strive to maximise the present value of his investment. This wealth maximisation would be achieved by the acceptance of all investment projects having a positive net present value when discounted at the individual's personal rate of return preference.
>
> Once the possibility of corporate finance is introduced, complications arise concerning the optimal choice of financing method and the appropriate discount rate to use in present value calculations.

In essence, Auerbach (1979) states that the main objective of the firm is the wealth maximisation of the shareholder. He states that the extent to which the firm is creating wealth for the shareholder is determined by calculating the net present value (NPV) of the cash flows associated with any existing and new projects. The discount rate that is used in the NPV calculation is the weighted average cost of capital implicit in the funding of the transaction. In order to further expand upon the notion of shareholder wealth

maximisation, thought needs to be given to the development of capital structure theory starting with Modigliani and Miller (1958).

1.1.1 Literature overview

In 1958, Modigliani and Miller published their seminal paper on the capital structure of a firm and how the structure that is employed affects the value of the firm. This paper started the capital structure debate and proposed that a firm's value is independent of its capital structure. Despite the success of the paper it was not without its flaws, as such Modigliani and Miller corrected their original assumption by publishing a revised paper in 1963. The revised paper found that capital structure does play a role in the valuation of the firm. According to Modigliani and Miller (1963), the tax deductibility of interest payments on debt (which has been incorporated into the firm's capital structure) shields the firm's pre-tax income (and as a result lowers the firm's tax liability and cost of debt financing) and results in a higher net income for the firm.

Modigliani and Miller's (1963) paper set forward a set of propositions which has been the topic of scrutiny and further studies, however, over time a few of the issues relating to the original paper have been put to rest. In particular, Proposition 1 (which holds the value of the firm constant independent of its capital structure) has been accepted as an implication of equilibrium in perfect capital markets (Miller, 1988). Despite this the 100% debt financing structure as proposed in the Modigliani and Miller's (1963) paper is unrealistic and does not work in reality, debt funders require a certain amount of equity to be included in the firm to mitigate the funders' risk implicit in lending money into a firm. Furthermore, the 100% debt financing is unrealistic due to the fact that the higher the debt levels of the firm, the higher the costs associated with the capital structure (Merton, 1974). Given these additional costs associated with debt financing, a new capital structure theory originated through the development of the Static Trade-Off Theory.

Under the static trade-off theory, Robichek and Myers (1965) assert that the optimal capital structure for a firm is one in which the value of the firm is maximised by trading off the benefits of debt financing with the costs associated with bankruptcy. Robichek and Myers' (1965) work was expanded on by Kraus and Litzenburger (1973) who state that the

firm must balance the benefits of debt funding with any and all costs that would arise should a firm not be able to make its debt repayments. The general academic view of the optimal capital structure was that firms needed to balance the tax advantages of debt against the present value of any potential bankruptcy costs (Bradley, Jarrel, and Kim, 1983). This view remained despite Miller's (1977) paper on Debt and Taxes in which he describes how, under certain conditions, personal taxes can offset any potential gains achieved through introducing debt into the capital structure of a firm.

Myers (1984) proposes an alternative method of arriving at the optimal capital structure, based on a pecking order of raising new financing. The pecking order approach assumes that interest tax shields and costs of distress are considered the second order in the choice of capital structure and that firms raise capital for future investment opportunities in a specific pecking order (Myers, 1984). Shyam-Sunder and Myers (1999) found that under the pecking order theory highly profitable firms with limited investment opportunities work down to low debt levels and firms whose investment opportunities outrun internally generated funds borrow more and more.

1.1.2 Capital Structure across Geography and Industry

In addition to the various capital structure theories that exist today, the choice of capital structure also varies according to the economy that the firm operates in (whether developing or developed). For example, Rajan and Zingales (1995) found that capital structures (once differences in accounting standards have been provided for) are fairly consistent across the different jurisdictions inherent within the G7 Countries (namely: The United States of America, Japan, Germany, France, Italy, the United Kingdom, and Canada). However, differences in capital structures do exist when less developed countries are added to the study. The economy of any particular country has a material impact on the net benefits of debt when defined in terms of productivity. Majumdar and Chhibber (1999), in their study on firms in India, Pushner (1995) on firms in Japan, and Onaolapo and Kajola (2010) in their study of Nigerian firms, conclude that there is a negative relationship between leverage and firm performance in developing countries. On the other hand, Nickell, Nicolitsas, and Dryden (1997), and Nickell and Nikolitsas (1999) found a positive relationship between leverage and firm performance in the United Kingdom. Lichtenberg

and Siegel (1990), Kaplan (1989), Smith (1990) and Denis and Denis (1993) found an increase in return on equity after leveraged buy-outs in the United States of America since leveraged buy-out procedure dictates a change in the debt to equity ratio after the transaction takes place.

The capital structure employed further varies according to the industry in which the firm operates as found by Bradley, Jerrell, and Kim, (1983). Bradley *et al.* (1983) conducted a test on firm leverage ratios across 25 industries and 851 firms, finding that different industries employ different capital structures. Bradley *et al*. (1983) found that the debt ratio varies widely across the various sectors, ranging from a low of 9.07% in the drugs and cosmetics industry to a high of 58.25% in the airline industry, their study did not include the IT industry as it exists today.

Given the findings of the studies as listed above which state that firm performance defers between the various economies in which the firm operates some thought needs to be given to the South African market which is one of the economies to be included in this study.

1.1.3 The South African Market

The structure of the South African economy can be defined as one in which the shareholders are in ultimate control of the firm through the presence of a single controlling shareholder. As a result of the concentrated ownership structure, the South African economy differs to the ownership and control structures that have prevailed in the US and UK markets while having affinities with continental Europe (Kantor, 1998).

The South African environment is dominated by companies under the control of a single powerful shareholder (through a minority stake), where control is defined as the ability to appoint the board of directors and in turn the senior executives. These powerful shareholders also typically control a number of other companies operating in a variety of sectors across South Africa. These alliances of companies, each with a single controlling shareholder, constitute the group structure that is prevalent in South Africa (Kantor, 1998).

Roberts (2004), based on data from StatsSA, supports Kantor's 1998 findings by concluding that the corporate ownership and control structures within the South African economy are

highly concentrated. Historically, there are four main conglomerate groups that control the majority of economic activity within South Africa, namely: Anglo American Corporation, Sanlam, Liberty Life and Rembrandt/Remgro, which in turn are each controlled by a specific family.

Given the shareholder controlled ownership structure employed in South African firms, the driver for shareholder wealth maximisation is prevalent in the South African context. Fosu (2013) in his study on capital structure and firm performance, based on evidence from South Africa, finds that financial leverage has a significant positive non-linear effect on firm performance. He defines firm performance as the return on assets divided by total assets and leverage as total debt divided by total assets.

Although this study takes cognisance of the various theories stated above and focuses on the wealth maximisation effects of leverage, it follows the Discounted Cash Flow model as presented by Fischer in "The Theory of Interest" (1907; 1930). This method was followed in the belief that the firm's capital structure will be chosen in order to maximise the value of the firm which in turn maximises shareholder value (Auerbach, 1979).

In light of the background on the South African economy and firm control structures as a whole, some background is needed on the Information Technology Sector in South Africa. Following the argument that capital structures may differ by sector, this study will focus on the information technology sector of South Africa.

Given the findings of Kantor (1998) and Fosu (2013), for the purposes of this study we will ignore the findings based on developing countries, as these results are skewed by the immaturity and illiquidity of the financial system in the respective developing economies and rather compare the South African Markets to those of developed countries with mature and liquid financial systems.

1.2 Overview of Information Technology in South Africa

Information Technology (IT) has become an integral part of (modern) society because of its universal use across the global economy and society in general. Over the years, the Information Technology industry has evolved from single computers working in isolation,

to data networks of personal computers linked to the internet. Today, this industry covers a much broader network of portable devices that serve as tools to connect to real time information enhancing access to education, financial services, healthcare and other services.

IT services are provided across a range of sectors within South Africa's economy including real estate, mining, manufacturing, petrochemical, agriculture, and travel and tourism allowing these sectors to operate more efficiently and competitively. According to the Institute of Information Technology Professionals South Africa (IITPSA), the South African IT industry contributes an estimated 7% to South Africa's gross domestic product (GDP) and is growing annually at approximately 6% per annum (Kneale, 2015). Gross Domestic Product can be defined as the total value of goods produced and services provided in a country during one year (Oxford dictionary, n.d.). According to research conducted by Gartner (2015), overall IT spending in South Africa is expected to reach US$26.6bn in 2016, and can be broken down per product type as per table 1.1 below:

Table 1.1: Breakdown of expected IT expenditure in South Africa according to sector for 2015:

Sector	IT expenditure
Devices	$6.294bn
Data Centre Systems	$666m
Enterprise Software	$2.042bn
IT Services	$6.544bn
Communications Services	$11.075bn

Source: Gartner (2015)

The expenditure on IT is driven by new digital business initiatives such as cloud/client computing, software-defined applications and infrastructure, and risk based security. Gartner (2015) identifies 10 key drivers of technology innovation across the globe which is contributing to IT spend, the different drivers are presented in *Figure 1.1* below.

Figure:1.1: Top 10 Technology Trends

Source: Gartner (2015)

If IT firms do not have adequate capital budgets and/or structures in place, these firms can potentially miss opportunities (increased revenue) that the drivers of technology innovation present due to a lack of financing. In order to maximise the value of the firm, these opportunities need to be explored, and as a result, thought needs to be given to the capital structure employed by firms in the IT sector.

Unfortunately, (to the best of the researcher's knowledge) no prior research exists that directly focuses on the capital structures of IT firms. The author has conducted preliminary research that has shown that there is a difference between the capital structures of JSE listed South African IT firms and the capital structures of NASDAQ listed US IT firms.

1.3 Problem statement

Despite the size of the South African IT industry and its contribution to GDP, to the best of the researcher's knowledge no prior (directly, relevant or focused) research on the capital

structures of JSE listed South African IT firms exists. Following on from the papers by Roberts (2004) and Bradley *et al.* (1983), (and in the absence of prior research) this study seeks to understand the capital structures of JSE listed South African IT firms.

In attempting to understand the capital structures employed, this study references Modigliani and Miller's (1958) assumptions regarding the capital structure of firms. The study makes use of the Modigliani and Miller's (1963) relaxation of their "no tax" assumption to calculate the value of the debt tax shield that is created through including leverage into the capital structure of the firm.

For further insight on the South African economy, this study references various studies that have been conducted on the capital budgeting processes of South African listed companies. For instance, Van Breda (2007) calculated the probability of default of the top 42 non-financial South African firms, the probability of defaulting on financial commitments serves as a proxy for the likelihood of incurring costs related to financial distress. Correira and Cramer (2008) conducted a sample survey to determine and analyse the corporate finance practices of South African listed companies in relation to the cost of capital, the capital structure that the firm employs and the capital budgeting decision process. Matemilola, Bany-Ariffin and Azman-Saini (2012) studied the capital structures of all South African listed firms (excluding financial firms), comparing the relationship between leverage and the shareholders' required return. Chipeta, Wolmarans and Vermaak (2012) examined the effects of the liberalisation of the South African economy on 70 JSE listed non-financial firms for a period from 1989 to 2007.

This study differs from previous studies in that it investigates the capital structures of JSE listed South African IT firms and seeks to understand the effect of capital structure on shareholder wealth maximisation. In addition to investigating the effect of capital structure, this study compares the capital structures of JSE listed South African firms to those of the JSE Top40 (excluding financial firms), in order to determine if a difference exists. It further goes on to compare the capital structures of JSE listed South African IT firms to those of a sample of NASDAQ listed US IT firms.

1.4 Objectives of the study

1.4.1 General Objective of the Study

The general objective of this study is to investigate the capital structures employed by JSE listed South African IT firms in order to compare and contrast their capital structures with the capital structures employed by the JSE Top40 non-IT firms (excluding financial services). In addition, the capital structures of the JSE listed South African IT firms will be compared to the capital structures employed by NASDAQ listed US IT firms in a comparative study.

1.4.2 Specific Objectives of the Study

The specific objectives are:

- To determine how the capital structures of JSE listed South African IT firms differ from the capital structures of all non-IT firms (excluding financial services) in the JSE Top40.
- To determine how the capital structures of JSE listed South African IT firms differ from those sampled from US IT firms listed on the NASDAQ.
- To determine if the capital structures of the sample firms and the Return on Equity have a relationship.
- To determine if the composition of the debt of the firm split between long term debt and short term debt make a difference to the effect on the firm's Return on Equity.
- To determine whether there is a relationship between the capital structure and earnings per share (EPS) of JSE listed South African IT firms, and NASDAQ listed US firms.

The study attempts to answer the following research questions:

1. Does a relationship exist between the Total Debt Ratio and Return on Equity? And if so, what is the strength of this relationship?
2. Does a relationship exist between the Long Term Debt to Total Debt ratio and the Return on Equity Ratio? And if so, what is the strength of this relationship?

3. To what extent (if any) does a relationship exist between the firm's Return on Equity and its Earnings per Share? And if a relationship does exist, what is the strength of the relationship?
4. Does a relationship exist between the Times Interest Earned Ratio and the Long Term Debt to Total Debt ratio? And if a relationship does exist, what is the strength of the relationship?
5. Does a relationship exist between the firm's Earnings per Share and its Long Term Debt to Total Debt Ratio? And if a relationship does exist, what is the strength thereof?

1.5 Data

The study made use of secondary data from two separate financial markets, namely the Johannesburg Stock Exchange (JSE) and the National Association of Securities Dealers Automated Quotations (NASDAQ). The data for the JSE was further split into JSE listed South African IT firms and the JSE Top40 excluding financial services as at the 01 January 2009.

1.5.1 Ethical Considerations

The data was readily available in the public domain either through each company's published annual financial statements or through a Bureau which has made use of the published information to calculate key ratios which were included in this study. Given that this study made use of information that was publically available there were no ethical considerations to take cognisance of.

1.5.2 Reliability and Validity of Data

The information included in the annual financial statements was subjected to vigorous testing through the internal and external (independent) audit process which culminated in the presentation of a set of annual financial statements. In each set of financials, the audit

firm who tested the financials expressed an opinion on the validity of the information contained in the financial statements. The researcher felt comfortable to trust the validity and reliability of the data given the vigorous testing of the audit process.

1.5.3 IT Sectors to be included in the study

The definition of IT both in South Africa (and globally) is quite broad and as such the sector is divided into various sub-sectors which include firms such as media, telecommunications and professional services. While these subsectors are in fact part of the greater IT sector, the difference in products and services that they offer could potentially cause outliers in the data if these were to be included in the study. To avoid this issue this study specifically excludes all sub sectors that do not directly relate to IT hardware or software production. Chapter Three deals with the subsectors included in the study in more detail.

1.6 Significance of the study

The study will contribute to the understanding of how JSE listed South African IT firms are capitalised, and how these capital structures relate to the rest of the South African market, as well as to the capital structures of NASDAQ listed US IT firms.

At this stage, limited research exists on the South African IT sector's capital structures. As such, this study will provide information for the executive management of current JSE listed South African IT firms, as well as other finance scholars, on how JSE listed South African IT firms are capitalised and how the capital structures translate into wealth maximisation for the shareholders. In addition, there will be a comparison of capital structures between JSE listed South African IT firms and all non-IT JSE Top40 (excluding financial services) firms to provide insight into any capital structure differences.

Further to the comparison between JSE listed IT firms and all non-IT JSE Top40 (excluding financial services), this study will contribute to the current body of knowledge by comparing the capital structures of the JSE listed South African IT firms to those of the

NASDAQ listed US IT counterparts, in an effort to determine if there is, in fact, a difference in capital structures employed between the two geographical locations.

The study will also contribute to the current body of knowledge by investigating the relationship between capital structure and earnings per share in a South African IT firm context, and attempt to explain the extent of the relationship between the two variables.

This dissertation is limited to a quantitative review of the relevant sectors and does not take into account any qualitative factors that may explain the current capital structures employed. A further limitation to the study is that the relevant economic factors relating to the geographic locations over the period under review have not been taken into account. The author has attempted to address this limitation to some degree by including all non IT JSE Top40 firms (excluding financial services) in the study in order to arrive at an approximation of the prevailing market trends in the South African market, however, this is no substitute for a detailed economic trend and impact analysis.

1.7 Chapter Exposition

This study is presented in five parts. Chapter One encompasses the introduction, a background of the study, an overview of the South African IT industry, problem statement, objectives of the study, as well as the significance and limitations of the study.

Chapter Two presents an overview on literature of the current capital structure theories, including the factors influencing management decision making with regards to capital structures and the effects of capital structures on the profitability and wealth maximisation of the firm.

Chapter Three details the research methodology that was adopted to achieve the research objectives.

Chapter Four of this study presents the data, analysis, and results of the study of JSE listed South African IT firms, JSE Top40 and a sample of NASDAQ listed US IT firms.

The summary; conclusions; recommendations and further research opportunities are presented in the final chapter of this study.

Chapter Two: Capital Structure Theory

2.1 Introduction

Modern capital structure was formally modelled by Modigliani and Miller (1958) who published a paper on the cost of capital. In their study, Modigliani and Miller (1958) prove that given a set of strong assumptions, a firm's value is unaffected by its capital structure. These original assumptions were later relaxed, and the effects of corporate taxes were taken into account (Modigliani & Miller, 1963). The result of the (1963) relaxation is that tax deductibility of interest payments shields the firm's pre-tax income from taxation (by reducing the firm's tax liability) which in turn results in a higher net income after tax. Under the assumption of the tax deductibility of interest payments, the firm's value equals the unleveraged value of the firm plus tax shields.

The tax deductibility of interest payments and the debt tax shield that it creates led to the development of further capital structure theories such as the static trade-off theory Robichek and Myers (1965). Under this theory, firms set a target capital structure, which seeks to balance the benefits of leverage, and the higher interest rates and bankruptcy costs. The static trade-off theory further evolved into the dynamic trade-off theory. Similar to the static trade-off theory, under the dynamic trade-off theory, firms still set an optimal capital structure, however, it will deviate from this structure through the course of business and will then adjust back towards the optimal structure over a period of time. Thereafter, the presence of flotation costs and asymmetric information gave rise to another theory; the pecking order theory. Under this theory, firms choose financing for future projects in a specific pecking order, starting with retained earnings being the cheapest form of financing, followed by debt, and finally with firms only issuing common shares as a last resort being the most expensive form of financing (Myers, 1984).

Various studies have further explored the impact of leverage on firm's performance. Stulz (1990) and Grossman and Hart (1982) view shareholders using debt as a measure of control over the management of a firm and thereby reducing the agency cost problem inherent in appointing an agent. Grossman and Hart (1982) state that managers of a firm that is predominantly equity-financed, do not have a strong incentive to maximise profit; i.e. without debt, bankruptcy cannot occur and as such, bad managers are not penalised as a

result of low profits. Stulz (1990) goes on to explain that there is a balancing act (i.e. optimal capital structure) necessary in introducing debt into the capital structure of a firm and that the right amount of debt is the balance between management's propensity to overinvest in projects (in some cases investing in negative net present value projects) and the restrictive nature of debt causing under-investment.

As such, managers and shareholders, using the optimal capital structure approach, set the firm's capital structure at a point that maximises shareholders' wealth. The optimal capital structure is defined as the mix of debt, preference shares and common equity that causes the share price of the firm to be maximised (Brigham and Ehrhardt, 2007). As the focus of this study is the application and relevance of the various capital structure theories to JSE Listed South African IT firms, the theories mentioned above, along with further developments in capital structure theory, will be explored further in the following sections.

2.2 Capital structure theory (Modigliani and Miller)

According to Modigliani and Miller (1958), the value of a firm is unaffected by the capital structure that the firm employs. Their study was based on the assumption of a perfect market and is summarised as follows:

1) there are no transaction costs;
2) there are no taxes;
3) there are no bankruptcy costs;
4) investors can borrow at the same rate as corporates;
5) all investors have the same information as management about the firm's future investment opportunities and
6) operating profit is not affected by the use of debt.

Based on the common assumption that the firm acts rationally, firms will tend to push investment to the point where the marginal yield on assets is equal to the market rate of interest. This is expanded on by showing that under conditions of certainty, the above proposition can follow on from two rational decision-making criteria, namely, (i) profit maximisation and (ii) the maximisation of market value (Modigliani & Miller, 1958:262). Despite Modigliani and Miller's (1958) assumptions being unrealistic and restrictive Stiglitz

(1969) supports their theory by proving that the Modigliani and Miller theorem holds true under a set of more general assumptions. Stiglitz (1969) addresses the matter of individuals being able to borrow funds at the same rate as firms by viewing an individual's wealth portfolio as a combination of equity and bonds. Given this assumption, the individual is then able to "borrow" funds from the market by selling off the corporate bonds in his/her portfolio and applying these funds to equity purchases. By doing so, the individual investor is then able to raise funds (borrow) at the market rate, and then use these funds to offset any capital structure decisions employed by a firm.

In order to aid in the presentation of their analysis, Modigliani and Miller (1958) made the assumption that firms can be divided into equivalent return classes such that the return on shares issued by any firm, in any given class, is proportional to the return on the shares issued by any other firm in the same class (Modigliani & Miller, 1958:266). The risk class assumption was later supported by Stiglitz (1969) by applying the Arrow–Debreu (Arrow and Debreu, 1954) theory to the market. Under the conditions as set by Arrow and Debreu (1954), Stiglitz (1969) argues that the individual can eliminate the variations in returns by trading in the open market. Using the equivalent returns' classes' assumption as a basis, Modigliani and Miller (1958) presented the following two propositions:

Proposition I:

The market value of any firm is independent of its capital structure and is given by capitalising its expected return at the rate appropriate to its class. This is represented by the following equation (Modigliani and Miller, 1958:268):

$$V_j = \left(S_j + D_j\right) = \frac{X_j}{p_k} \qquad (1)$$

Where:

V_j = value of the firm,

S_j = market value of the common shares of firm *j*,

D_j = market value of the debt of the firm *j*,

P_k = expected rate of return for firm *j* in class *k*, and

X_j = the expected return per share of firm *j*.

Equation (1) can be restated in terms of the firm's average cost of capital:

$$\frac{X_j}{S_J + D_j} = \frac{X_j}{V_j} = p_k \qquad (2)$$

That is, "the average cost of capital to any firm is completely independent of its capital structure and is equal to the capitalisation rate of a pure equity stream in its class" (Modigliani & Miller, 1958:270). In other words, the value of the firm is solely dependent on the return per share divided by the expected rate of return. If Equations (1) and (2) do not hold between any pair of firms, the process of arbitrage will bring the values of the firm back into equilibrium.

Proposition I has received criticism for the arbitrage assumption that it applies. However, similar arbitrage proofs have been presented by Cornell and French (1983) in their study on the pricing of stock index futures, Black and Scholes (1973) on the pricing of options, and Ross (1976) on the structure of capital asset prices, resulting in the fact that Proposition I is generally accepted in economic theory.

Proposition II:

"The expected yield of a share is equal to the appropriate capitalisation rate for a pure equity stream in the class, plus a premium related to financial risk equal to the debt-to-equity ratio times the spread between the capitalisation rate and the risk premium." (Modigliani and Miller, 1958:271)

$$i_j = p_k + (p_k - r)D_j/S_j \qquad (3)$$

Where:

i_j = expected rate of return per share of firm *j*

p_k = cost of capital of pure equity share

r = required rate of return on debt

D_j = value debt in capital structure of firm *j*

S_j = value of equity in capital structure of firm *j*

Modigliani and Miller (1958) went on to relax their original assumptions and introduced corporate taxes into their model. Despite the introduction of corporate taxes, effectively lowering the cost of any debt introduced into the firm's capital structure Modigliani and Miller (1958) argued that the expected return on equity increases proportionally to the increase in gearing within the firm's capital structure. This increase in return on equity as the gearing ratio increases keeps the weighted average cost of capital constant and, as a result, the value of the firm remains the same.

The assumptions by Modigliani and Miller (1958) are unrealistic in their definition of markets as, in reality, the concept of a perfect market does not hold true and transaction costs do exist, meaning that investors and corporates are not able to switch out their positions easily and at no cost. The difficulty runs deeper than the assumption of perfect markets, Durand (1959) pointed out that the concept of an equivalent return class is derived from a static equilibrium and is not adaptable to dynamic economies. Durand (1959) concluded that the cost of capital should measure the inducement in terms of current earnings plus any potential long-term growth.

In support of this, Stiglitz (1974) argues that the original theory as presented by Modigliani and Miller (1958) does hold true in a frictionless world in which transaction costs, tax distortions and other frictions are non-existent. In addition, taxation and bankruptcy costs are present, meaning that corporates need to take the benefit of the tax deductibility of interest payments into account while balancing the rising costs of potential bankruptcy as debt levels increase. Furthermore, investors are not able to borrow at the same rate as corporates, and asymmetrical information does exist.

Modigliani and Miller (1963) found that the effect of corporate taxes, and in particular, the interest deductibility on interest payments from corporate taxes, was greater than postulated in their 1958 paper. By doing so Modigliani and Miller (1963) found that the

introduction of corporate tax into their original model introduces an interest tax shield to the firm. This interest tax shield effectively lowers the firm's cost of capital by the tax rate (i.e. the tax deductibility of interest payments results in a smaller tax liability which can be translated as a rate subsidy) as per equation 4 below:

$$i_d = r_d(1 - t) \tag{4}$$

Where:

i_d = interest rate post accounting for the tax deductibility of interest

r_d = interest rate before accounting for the tax deductibility of interest

t = current tax rate

As a result of accounting for the interest tax shield as per equation 4, the effective cost of debt is lower by the multiple of the tax rate applied to the relevant debt interest rate charged.

As such, Modigliani and Miller (1963) concluded that the debt tax shield created by adding debt to the capital structure adds value to the firm as follows:

$$V_l = V_u + debt\ tax\ shield \tag{5}$$

Where:

V_l = value of a leveraged firm, and

V_u = value of an otherwise identical unleveraged firm.

According to equation (5), Modigliani and Miller (1963) concluded that firms should use pure debt finance to maximise the value of the firm (and hence maximise shareholder wealth).

However, despite the tax deductibility of interest payments and the debt tax shield that this creates, Modigliani and Miller (1963) cautioned against the fallacy of attempting to use purely debt financing in company capital structure, due to the strict limitations that lenders

impose on the amount that firms can borrow in relation to their equity. Theoretically, firms should use purely debt financing, however, Modigliani and Miller (1963) cautioned that firms should also hold some lending capacity in reserve.

Miller (1977) expanded on Modigliani and Miller's (1963) study, in his "Debt and Taxes" paper by explaining the lack of debt in corporate firm's capital structures. He found that the debt ratios of the typical non-financial corporation in the 1950s were little different to that of the financial corporates in the 1920s, despite the fact that tax rates had risen sharply (Miller, 1977:264).

Miller (1977) also found that when personal tax is taken into account along with corporate income tax, the gain from leverage for the shareholders in a firm holding real assets, can be shown by the following equation:

$$G_L = \left(1 - \frac{(1 - t_c)(1 - t_{ps})}{1 - t_{PB}}\right) B_L \tag{6}$$

In Equation (6) t_c, is the corporate tax rate, t_{ps} is the personal income tax rate applicable to income from common shares, t_{pb} is the personal income tax rate applicable to income from bonds and B_L is the market value of the leveraged firm's debt. Equation (6) proposes a methodology for calculating the gain from leverage (G_L) (for the shareholders in a firm that holds real assets).

Given the introduction of personal income tax, Miller (1977) concluded that the effects of the interest deductibility under corporate tax law are more than offset by the effect of personal taxes on income received from bonds.

Let us further relax the assumptions of Modigliani and Miller (1958) with interest rates and corporates being able to borrow at the same rate as investors. In reality, corporates have access to cheaper lines of funding than the average individual, thus reducing the cost of funds and as a result, reducing the weighted average cost of capital.

The various theories that originated from the Modigliani and Miller's (1958) and (1963) papers will be explored in greater detail in the sections that follow.

2.3 The Trade-off Theory

It was the introduction of potential bankruptcy and associated costs that gave rise to the static trade-off theory, as first hypothesised by Robichek and Myers (1965). The theory originated due to the fact that the proof of the Modigliani and Miller's (1963) theory is independent of the assumption that the firm will be able to earn its debt repayment obligation with certainty. In fact, the firm may not earn the required return in order to make its debt repayments, which would result in bankruptcy (Kraus and Litzenberger, 1973: 911). The static trade-off theory argues that provided the firm earns the required rate of return in order to make its debt repayments, financial leverage lowers the firm's corporate income tax liability and increases its after-tax operating income.

The static trade-off theory further states that the optimisation of the capital structure involves a trade-off between the present value of the tax rebate associated with a marginal increase in leverage, and the present value of the marginal cost of the disadvantages of leverage (Robichek and Myers, 1965:20). In support of the argument that a firm needs to balance the benefits of debt with the costs thereof, Baxter (1967) found that bankruptcy costs are significant and play an important role in the capital structure decision, finding that bankruptcy costs can account for up to 20% of firm value. These findings were, however, based on personal bankruptcy proceedings, which makes it difficult to apply to a corporate setting. Warner (1977) expanded on the findings of Baxter (1967) by studying eleven railroad firms which filed for bankruptcy. In contrast to the findings of Baxter (1967) he found that bankruptcy costs only account for 1% of the firm's value (firm value is determined as firm value 7 years prior to filing for bankruptcy, before the beginning of the firm's decline into bankruptcy), and as a result found that bankruptcy costs are insignificant to large corporates. Warner (1977) also found that there are large fixed costs associated with bankruptcy which tend to be sticky, which means that the significance of the bankruptcy costs decreases as the value of the firm increases. Andrade and Kaplan (1998) in their study of 31 high leverage transactions, found that high leverage is the primary cause of financial distress whose costs account for 10 to 20% of firm value, while poor firm performance and poor industry performance play smaller roles. Although this may seem different from Baxter (1967) and Warner (1977), Andrade and Kaplan (1998) distinguish

between firms that experience negative economic shocks (i.e. systemic shocks) to those that do not. They concluded that in firms that do not experience negative economic shocks, the costs of financial distress are negligible and thus support the findings of Warner (1977).

While Baxter (1967) and Warner (1977) focus on the financial (direct) costs associated with financial distress (bankruptcy), Opler and Titman (1994) propose that there are other costs that need to be taken into account when assessing the costs of bankruptcy. In particular, although direct costs of financial distress are found to be negligible, Opler and Titman (1994) find that the indirect costs of financial distress can be substantial in the form of lost market share and lower market values of equity. Thus, when calculating the bankruptcy costs to be included in the static trade-off theory, both direct and indirect costs need to be considered as many direct costs, as is the case in Baxter (1967) and Warner (1977), can be avoided by simply avoiding filing for bankruptcy, while indirect costs can be incurred as managers and stakeholders restructure the firm in order to keep operations going. (Also see Frank and Goyal (2009) in their study of publically traded American firms; McConnell and Servaes (1995) in their study investigating the relationship between corporate value, leverage, and equity ownership; and Driffield, Mahambare and Pal (2007), in their study of four East Asian countries in which they examine the effects of ownership structures on capital structure and firm valuation, for an empirical test of the assumption regarding indirect bankruptcy costs.

Figure 2.1 graphically represents the static trade-off theory of optimal capital structure:

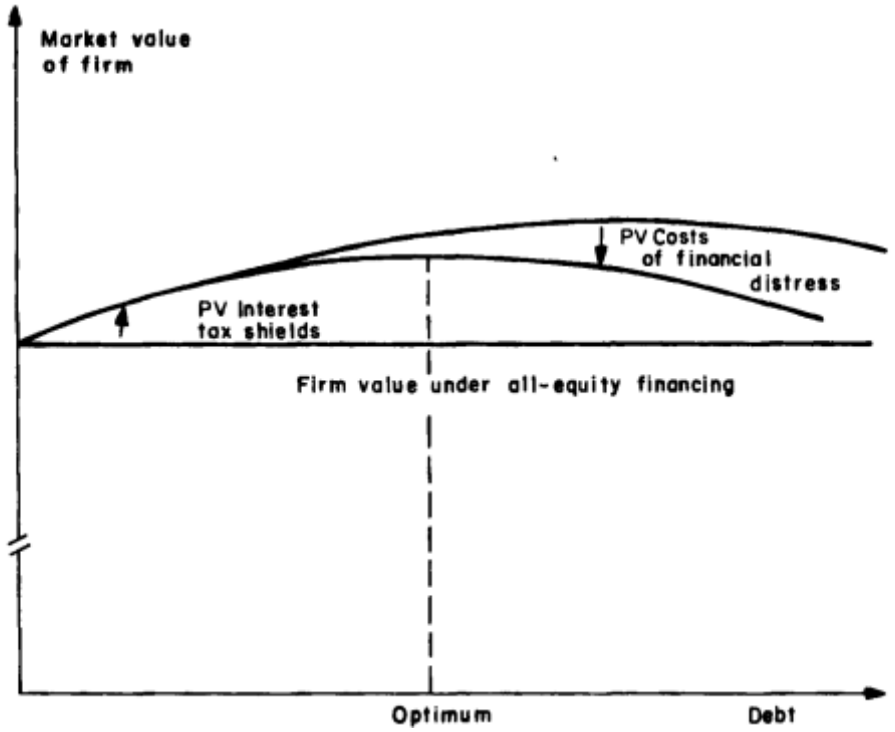

Figure2.1: The static trade-off theory of capital structure
Source: Myers (1984)

Therefore, under the static trade-off theory the firm is meant to substitute debt for equity or vice versa, until the value of the firm is maximised (that is, the point at which the marginal costs of debt offset the marginal benefits).

Myers (1984) further expanded on the static trade-off theory, by introducing costs of adjustment. Costs of adjustment can be defined as any costs associated with adjusting the firm's capital structure (Brigham & Davies, 2007). Myers (1984) states that in the absence of costs of adjustment the firm's observed debt-to-value ratio should be its optimal ratio. However, with the presence of adjustment costs, there will be lags in adjustment as firms cannot immediately offset any excursions away from the optimal structure caused by random events within the course of operations (Myers, 1984). The introduction of lags in adjustment as set by Myers (1984) lead to studies around the speed at which the firm will adjust back to its optimal capital structure. Elsas and Florysiak (2011), Huang and Ritter (2009), Nunkoo and Boateng (2010) and Ramjee and Gwatidzo (2012) define the speed at which a firm adjusts its capital structure back to its defined optimal capital structure as the

'Speed of Adjustment'. In addition, they find that firms do in fact adjust towards a desired capital structure over time, thus these findings support those of Myers (1984). Dang, Kim and Shin (2012) found evidence that supports the trade-off theory, using a dynamic panel threshold model approach.

In recent times, Coricelli, Driffield, Pal and Roland (2011) find evidence in a sample of Central and Eastern European countries that supports the trade-off theory by using total factor productivity to determine optimal capital ratios. Hansen (2000) defines the optimum amount of leverage as the amount of leverage at which productivity is maximised, despite the firm's tendency to temporarily deviate from this optimum level from time to time (Refer to Korajczyk and Levy, 2003 for empirical evidence based on observed leverage ratios). Kayhan and Titman (2007) again find evidence that supports the trade-off theory by studying firms' capital structures over long periods of time. Refer to Warner (1977), Schleifer and Vishny (1992), Myers (1977), Jensen (1986), Jensen and Meckling (1976) for further studies on the optimal capital structure, and Moyo, Wolmarans and Brummer (2013) for evidence supporting the trade-off theory in manufacturing, mining and retail firms listed on the Johannesburg Stock Exchange.

Therefore, with the view of maximising the firm's value (and ultimately shareholder wealth), the trade-off theory states that the value of a leveraged firm is equal to the value of an otherwise identical unleveraged firm, plus any interest tax shields present plus agency costs (which incorporate costs associated with financial distress, as well as the underinvestment problem, identified by Myers (1977).

To better understand the trade-off theory and a firm's decision to adopt it, attention needs to be given to external factors that may affect the firm's choice of optimal capital structure and its use of debt, namely the economy and the industry in which the firm operates. The economy that the firm operates in (whether developing or developed) has a material impact on the net benefits of debt when defined in terms of productivity. Salehi and Biglar (2009) found, in a study of 117 corporates listed on the Tehran Stock Exchange over a 5 year period that the capital structures of firms do in fact affect financial performance. Majumdar and Chhibber (1999) in their study on firms in India, Pushner (1995) on firms in

Japan and Onaolapo and Kajola (2010) in their study of Nigerian firms, showed that there is a negative relationship between leverage and firm performance in developing countries. On the contrary, Nickell, Nicolitsas, and Dryden (1997), and Nickell and Nikolitsas (1999) found a positive relationship between leverage and firm performance in the United Kingdom. While Lichtenberg and Siegel (1990), Kaplan (1989), Smith (1990) and Denis and Denis (1993) concluded that there is an increase in return on equity after leveraged buy-outs in the United States of America, since leveraged buy-out procedure dictates a change in the debt to equity ratio after the transaction takes place. Korajczyk and Levy (2003) found that macroeconomic conditions account for a substantial proportion (22-72% for the constrained sample and 12-52% of the unconstrained sample are related to macroeconomic conditions) of the time variance in the target leverage ratio that is set by firms. They also find that firms consider how far they are from their target leverage, as well as the marginal costs associated with issuing one security over another when issuing new securities (Korajczyk and Levy, 2003). These studies support the notion that the economy in which a firm operates in affects the performance of a firm.

Given the evidence from the various studies listed above, attention needs to be given to the economy in which the firm operates. For the purposes of this study, we will ignore the findings based on developing countries, as these results are skewed by the immaturity and illiquidity of the financial system in the respective developing economies.

As mentioned the industry in which the firm operates also has an effect on the capital structure that the firm employs and the extent to which this capital structure has on the firm's value. Muradoglu and Sivaprasad (2007) in their study of firms listed on the London Stock Exchange, find that the relationship between returns and leverage is positive in utilities, which is consistent with the findings of Modigliani and Miller and negative in the oil and gas industries, which in turn is consistent with Penman, Richardson and Tuna (2007). Further to the industry effects on a firm's capital structure Schleifer and Vishny (1992) include liquidity costs to the costs of bankruptcy, hypothesising that when a firm is in financial distress and needs to sell its assets, it is likely that its industry peers are experiencing financial problems as well, leading to assets being sold at below value in best

use. They further add that when liquidity increases, the assets will approach their values that would be realised under best management.

Given the findings of Bradley, Jerrell, and Kim, (1983) and Schleifer and Vishny (1992) along with those of Muradoglu and Sivaprasad (2007) the optimal capital structure of the firm is also affected by the industry in which the firm operates as firms operating in the same industry may be subject to industry shocks. As stated, no prior research exists on the capital structures employed by the IT industry, as such further research is required in the capital structures employed by the IT sector and whether support can be found for the trade-off theory.

The economy and industry effects aside, introducing debt into the capital structure of the firm have other potentially unintended benefits of the shareholders of the firm. In order to better understand these additional benefits, some thought needs to be given to the agency cost theory. Jensen (1986) defines the agency cost theory as the conflict between shareholders and managers. He states that the pay-out of cash to shareholders reduces the resources under managers' control and power, and increases the likelihood that the firm's managers will incur capital market monitoring costs when attempting to raise new capital, whereas by using internally raised funds to finance new projects managers, avoid the need for external monitoring (see also Rozeff, 1982; and Easterbrook, 1984).

Jensen and Meckling (1976) define agency costs as the sum of: the monitoring expenditures by the principal (firm's owner), the bonding expenditures by the agent (managers of the firm), and the residual losses that arise in any situation in which a cooperative agreement exists between a principal and an agent. According to Jensen and Meckling (1976), monitoring costs are those costs incurred by the firm's owners to "control" the behaviour of their appointed managers through budget restrictions, compensation policies, and operating rules. Bonding costs can be defined as costs incurred by a firm's managers as control measures to ensure that the agent (manager) does not act in a manner that would otherwise harm the principal (firm's owner) (Jensen and Meckling, 1976). Residual costs are the dollar equivalent of any loss due to the divergence in agendas of the agents (a firm's managers) from those of the firm's principals (owners) that do not

relate to monitoring or bonding costs. Jensen and Smith (1986) further expanded on this definition by stating that residual claims are claims to net cash flows and arise from differences between cash inflows and promised payments to other claimholders.

The agency cost theory depicts a situation in which the firm's shareholders may have an optimal size at which the firm should operate on one hand while the other managers will push the firm size beyond this point in order to increase their own compensation and prestige (Murphy, 1985; Jensen, 1986). In support of Murphy (1985), Jensen (1988) found that managers of large firms were spending large amounts of excess cash on investing into non-core activities that were not adding value to the firm and ultimately its shareholders. Kouki and Guizani (2009), in their study conducted on a panel of Tunisian firms from 1995 to 2001 in which they concluded that firms with highly concentrated ownership distribute more dividends, found that shareholders can avoid the issue of overspending by managers by calling for larger dividends. Theoretically, the increased dividends should translate into greater firm value, however, Denis and Osobov (2008) alluded that outside of the United States of America there is little evidence of a systematic positive relation between the relative prices of dividend paying and non-paying firms and the propensity to pay dividends. These findings support the agency cost theory.

Although this study has acknowledged the potential costs associated with bankruptcy and financial distress, it has yet to take cognisance of the benefits of debt as a motivating force for managers in order to ensure proper management of shareholders' wealth (Jensen, 1986). Including debt in the structure of the firm, not only introduces a debt tax shield with which to maximise the value of the firm, but introduces also effective controls in the form of mandatory principal and interest repayments to debt holders. Debt, therefore, forces managers to pay cash from the firm to debt holders, thereby reducing the ability for fruitless spending, and as a result, reduces agency costs. In support of the argument to use debt as a measure to counter agency costs, Jiraporn and Gleason (2007) found that the weaker shareholders' rights, the greater the agency costs. This is as a result of managers being better able to exploit weak shareholder rights. Jiraporn and Gleason (2007) found that the more restricted the shareholders' rights, the greater the leverage employed in order to counter agency cost. Margaritis and Psillaki (2007) in an empirical study conducted

using a sample of 12 240 New Zealand firms, found evidence that supports the Agency Cost-Trade off Theory. Margaritis and Psillaki (2010), in their study on French manufacturing firms, adopt productivity efficiency, as proposed by Berger and di Patti (2006), as a measure of firm performance and investigate whether more efficient firms use more or less debt in their capital structures. They proposed two competing hypotheses, namely, the efficiency-risk and franchise-value hypotheses. Under the efficiency-risk hypothesis, more efficient firms choose higher leverage ratios because higher efficiency is expected to lower the costs of bankruptcy and financial distress. The franchise-value hypothesis states that more efficient firms tend to hold extra equity capital, therefore, all else being equal, choose lower leverage ratios to protect their future income. Margaritis and Psillaki (2010) found that the efficiency-risk hypothesis holds in the firms that they studied with the exception of firms which operate in the chemicals manufacturing industry which uphold the franchise-value hypothesis.

Melo and Parsons (1992) assert that in the absence of agency costs of debt, the value of the firm would be the value of its equity plus any interest tax shields. The value of the firm will thus rise with each incremental addition of a predefined unit of debt by the interest tax shield that accompanies the incremental addition (Melo and Parsons, 1992). The introduction of agency costs modifies this assumption. Once agency costs are introduced, the value of the firm will increase with each additional unit of debt by the interest tax shield that the extra unit of debt allows less the marginal agency cost associated with that particular level of debt (Melo and Parsons, 1992), to the point where the marginal increase in value created by the interest tax shield is outweighed by the marginal agency cost associated with the extra debt. Thus, a firm's optimal capital structure is a mix of debt and equity which maximises shareholder wealth, whilst keeping agency costs in check (Melo and Parsons, 1992).

2.4 The Signalling Theory

Modigliani and Miller first raised the concept of dividend relevance in capital structure in their 1958 paper. While not strictly an argument on capital structure, dividends have been used as a basis to measure a firm's value by defining share value as a function of dividends

paid and the required rate of return. Gordon (1959) and Lintner (1962) proposed that the value of the firm can be expressed as follows:

$$P_0 = \frac{D_0(1+g)^t}{(1+r_s)^t} \quad (7)$$

Where:

P_0 = price/value of the shares at time 0,

D_0 = declared dividend at time 0,

g = expected growth rate, and

r_s = required rate of return.

Equation (7) does, however, have a few limitations (Brigham and Ehrhardt, 2007):

1. It can only be used in a situation of a mature industry and for a firm with a history of stable growth.
2. The model will only provide a valid value if *r* is greater than *g.*
3. The model only takes dividend values into account, thus is unable to account for long term growth prospects of the firm.
4. As the model only considers the value of the share given a dividend, expected growth rate, and required return, it does not take the capital structure employed by the firm into account.

Modigliani and Miller (1958), however, argue that dividends are irrelevant because investors can generate their own cash-flow streams by selling a portion of their shareholdings, and that a firm is valued purely as a function of its earnings over the firm's expected return. Modigliani and Miller (1958) further assumed a situation of symmetric information, where in reality the firm's managers have more information than outside investors (a situation of asymmetric information exists). Symmetric information is a situation wherein all market participants (Investors and firm managers) have equal information about a transaction or firm (Brigham & Davies, 2007), while asymmetric information is a situation in which one party has access to more or superior information

than other market participants (Brigham & Davies, 2007). Given a market in which information asymmetry does in fact exist, Modigliani and Miller (1963) and Linter (1956) affirmed that dividends carry information regarding a firm's future earnings.

Lintner (1956) found that managers will increase dividends only when they are confident that they will not have to reverse the decision in the near future. In support of this, Bhattacharya (1979), John and Williams (1985), and Miller and Rock (1985) inform us that changes in dividend policy convey news about the future cash flows of the firm. In support of Lintner's (1956) findings, Healy and Palepu (1987) found that "managers appear to consider both past and future earnings performance when they decide to initiate cash dividends. Dividend initiation decisions are therefore interpreted by the market as managers' forecasts of future earnings increases". A further study conducted by Grullon, Michaely and Swaninathan (2002) containing 7 642 dividend change announcements drawn from all listed firms on the New York Stock Exchange and American Stock Exchanges between 1967 and 1993, found that firms that increase dividends tend to experience a significant decline in their systematic risk and vice versa. The dividend increasing firms do not increase their capital expenditure and experience a decline in profitability in the years after the dividend change. Grullon, Michaely and Swaninathan (2002) found that the positive market reaction to a dividend increase is related to the subsequent decline in systematic risk. This is in contrast to Healy and Palepu's (1987) findings that firms that initiate dividends experience an increase in future earnings and that the market reaction in price increase is, in fact, a reflection of the drop in systematic risk associated with the firm.

The distinction to be drawn between the studies of Grullon *et al*. (2002) and Healy and Palepu (1987) is that the former focused on the effects of a dividend paying firm adjusting the level of dividend paid, while the latter focused only on firms that were initiating or omitting dividends. Both studies, however, supported Lintner's (1956) findings in that changes in dividend policy do in fact convey earnings information to the market, and thus affect the market value of the firm.

Based on Lintner's (1956) findings, dividend policy and changes thereto do in fact have an impact on the valuation of a firm, whether through the information content on future earnings or by using the expected dividend to directly calculate the value of a single share.

Ross (1977) expands on the signalling theory by showing how the debt/equity ratio might also serve to signal management's special information about the firm's future prospects. In support of this, Asquith and Mullins (1986) find that cash outflows in relation to capital (i.e. dividend increases and stock repurchases) are viewed as positive signals insofar as the firm's expected future earnings are concerned (refer also to Leland and Pyle (1977) who developed a similar model). Myers and Majluf (1984) support this theory by assuming that managers act in the interest of existing shareholders, meaning that if the firm's managers believe that the firm is undervalued, managers would prefer to issue new debt. In doing so managers do not dilute the current shareholders stake in any new profits to be made on investments (refer also to Smith (1986) and Jensen and Smith (1985)). Jensen and Smith (1985) in a summary of 13 studies (by: Maulis (1983), McConnell and Schlarbaum (1981), Dann and Mikkelson (1984), Asquith and Mullins (1985), Mikkelson (1981)) of the abnormal share price changes associated with the announcement of various transactions which change the capital structure of firms, and Smith (1986) in an empirical study of stock price changes find that leverage increasing transactions result in significant increase in common shares prices. While leverage reducing transactions have the inverse effect and result in significant common share price decreases (Jensen, 1986; Jensen and Smith, 1985; Smith, 1986).

Given the information content that is conveyed by announcements to changes in capital structure, a firm with good future investment prospects would not want to issue new shares as this would allow new investors to share in the increased profits. The management of such a firm would prefer to issue lower cost debt in order to keep all the gains for current equity investors. However, a firm with negative future prospects would prefer to issue new shares as opposed to new debt in order to allow for new investors to share in any future losses thus shielding any current investors.

Lintner (1956) found that any firm's savings in a given period are a by-product of dividend action taken in terms of established practices and policies; i.e. dividends are rarely a by-product of current decisions regarding the desired savings ratio. He found that once earnings for the year have been reported, managers would give consideration to how large the change in dividend pay-out should be, only after management was convinced that a change in the dividend pay-out rate would solicit a positive result from investors.

Managers would generally plan ahead with regards to amending the dividend policy in order to ensure that the pay-out would not put the firm in a short liquidity position and would draw upon working capital in order to meet the dividend pay-out ratio (Lintner, 1956: 105). Dan and Mikkelson (1983) show that the signalling theory applies to changes in the firm's capital structure as well, with an increase in leverage being a positive signal which corresponds with an increase in the price of common stock traded in the open market and vice versa. Convertible debt issuances convey less favourable information about future earnings than an otherwise similar straight debt announcement, consequently implying that the share price's response to an announcement of convertible debt offering is less favourable than the response to an announcement of a straight debt offer *ceteris paribus* (Dann and Mikkelson, 1983).

2.5 The Pecking Order Theory

Myers (1984) proposed an alternative method of arriving at the optimal capital structure based on a pecking order of raising funds (the pecking order theory). The pecking order theory assumes that interest tax shields and the threat of financial distress are less important than the firm's need to raise funds. Firms that follow the pecking order theory do not specifically set an optimal capital structure to work towards, the capital structures employed are rather a result of the present and historical funding requirements of the firm.

The Pecking Order Theory states that (Myers, 1984):

1) Firms prefer internal finance.
2) Firms adapt their target dividend pay-out ratios to their investment opportunities, although dividends are sticky and target pay-out ratios are only gradually adjusted to shifts in investment opportunities.
3) Sticky dividend policies, plus unpredictable fluctuations in profitability and investment opportunities, mean that internally-generated cash flow may be more or less than investment outlays. If it is less, the firm first draws down on its cash balance or marketable securities portfolio.
4) If external finance is required, firms issue the safest security class first. They start with debt, then possibly hybrid securities and then equity.

As discussed in the section on the signalling theory sticky dividend policies reflect the reluctance by the management of a company to adjust dividend pay-outs, as this is viewed as a signal to the market of a firm's future prospects (Wessels, 2005). In support of this, Juma'h and Pacheco (2008) find that managers do use dividend policy to send positive signals to investors. Under this approach, firms raise capital for future investment opportunities in a specific pecking order - starting with internally generated funds (retained earnings), then debt, preference shares and finally a share issue as a last resort. As a result, debt ratios change when there is an imbalance of internal cash flow, net of dividends, and real investment opportunities. According to Shyam-Sunder and Myers (1999), highly profitable firms with limited investment opportunities work down to low debt levels, while firms whose investment opportunities outrun internally generated funds, borrow more and more. The firm would only move onto the next form of financing once the current form has been exhausted. Intuitively, a firm would follow this model due to the ease of access to internally generated funds, and the unwillingness to leverage the balance sheet. The pecking order theory derives its influence from a number of facts about how companies use external finance. Myers (2001) reports that external finance covers only a small proportion of capital formation and that equity issues are minor, with the bulk of financing being debt.

According to the pecking order theory, companies with few investment opportunities and substantial free cash flow will have low debt ratios and high growth firms with lower operating cash flows will have high debt ratios (Myers, 2001). Following the pecking order assumptions on the order in which firms raise funding, high-growth firms (with typically high financing needs) will end up with high debt ratios because of a reluctance to issue equity. Smith and Watts (1992) and Barclay and Smith (1999), however, suggest the opposite, stating that firms with growth options are more likely to have lower dividend pay-out ratios and will tend to fund new investment opportunities from retained earnings and as a result, will have lower debt ratios, while firms that have assets in place will tend to have higher debt ratios. This is supported by Gomes and Schmid (2010) who find that highly leveraged firms are also mature firms with relatively more book assets (safer) and fewer growth options (riskier). In addition, Eriotis, Vasilouw and Ventoura-Neokosmidi (2007) found that larger firms can negotiate for loans on more favourable terms, which creates an incentive to accumulate more debt at lower interest rates.

The findings of Smith *et al.* (1992) are supported by the findings of Goyal, Lehn and Racic (2002) who found that when the growth opportunities of defence firms decline, the firms use of debt financing increases. They find that the structure of the defence firm's debt changes as growth opportunities decline, the firms in their study push out the maturities of their debt. These findings are consistent with Myers' (1977) argument that firms wanting to mitigate the risk of underinvestment can do so by issuing short term debt. By doing so, the firm will be able to retire the cheaper short term debt and as a result, reap more of the rewards of any net present value projects that it has undertaken. Goyal *et al*. (2002) found that as growth opportunities in the defence industry declined, defence firms increased their use of debt, lengthened the maturity structures of their debt, reduced their use of bank provided (private) debt, increased their use of public debt and reduced their reliance on high priority debt. The findings of Goyal *et al*. (2002) are consistent with the pecking order theory. Aivazian, Ge and Qui (2005) supported the conclusions reached by Goyal *et al*. (2002), in their study of Canadian firms. They found that leverage and growth opportunities are negatively correlated, as did McConnell and Servaes (1995) in their study of non-farm US firms. Franklin and Muthusamy (2011), however, found a contrasting view in that their results established that a positive relationship exists between leverage and

growth opportunities in Indian pharmaceutical firms, while Barclay, Morellec and Smith (2001) present a model in which debt capacity of growth options can be negative. Barclay *et al*. (2001) found that firms with growth opportunities are likely to have lower debt levels, but there is also an optimal capital structure that balances the costs of overinvestment with those of underinvestment.

Lemmon and Zender (2010) found evidence that supports the pecking order theory for a broad cross-section of firms over an extended period of time. As the growth opportunities of the firms included in their samples increased, the firms would have used additional cash on hand in order to service new positive net present value projects and then started using debt (as opposed to issuing new equity) in order to fund new projects. Once the growth opportunities declined, the firms restructured their debt into longer maturity structure publicly traded type debt (i.e. bonds) and retired the shorter dated bank debt, these findings are consistent with those of Myers (1977). At no stage was new equity issued in order to fund new projects.

The pecking order theory states that any changes in debt would track the financing deficit given a set of investment opportunities more closely than would any net changes in equity, as a result of debt being more preferable, according to the pecking order theory. Frank and Goyal (2003) found the inverse to be true. Although theoretically different from the static trade-off theory due to costs of adjustment, both the static trade-off theory and the pecking order theory are used in practice with large lumpy adjustments to capital structure being actioned at a given point in time (Frank and Goyal, 2003).

Frank and Goyal (2003) find that the size of the firm is critical as to whether the pecking order theory holds true or not. Large firms (in a sample of firms reporting annual results over a period from 1990-1998) show support for the pecking order theory in earlier decades of the time series, while smaller high growth firms provide the strongest rejections of the theory. The findings later invert with support for the pecking order theory declining in large firms later in the time series.

Barclay and Smith (1999) found that the evidence in mature firms that generate excess free cash flow, shows a departure from the pecking order theory in that despite the excess free cash flows, the firms maintain a certain level of leverage within their capital structures. Conversely, the pecking order theory implies that high-tech start-up firms will have high leverage ratios because they often have negative free cash flows and incur the largest information costs when issuing equity. However, such firms are financed almost entirely with equity (Barclay and Smith, 1999).

In conclusion, Harrison and Widjaja (2013) find that during the 2008 global financial crisis, the pecking order theory held more of an explanation with regards to the firms financing behaviour than the trade-off and market timing theories. Mukherjee and Mahakud (2012) find, in their study of Indian manufacturing firms, that the pecking order and trade-off theories are not mutually exclusive, and that firms make use of both at any point in time. They also find that the firms have a target capital structure and adjust towards this over time. Mukherjee and Mahakud (2012) are supported by Moyo (2014) who found that the pecking order and static trade-off theories are not mutually exclusive, and that firms will make use of both approaches to raising capital. However, they will eventually adjust their capital structure towards a target capital structure. This is in contrast to Byoun (2008) who found that firms adjust towards a target capital structure only when they are faced with a financial surplus or deficit, and the adjustment is not done in accordance with the pecking order theory.

2.6 Market Timing Theory

Under the Market Timing Theory, firms attempt to time the market by issuing equity only when the share price of the firm is high and repurchasing shares when the price is low. As a result, the current capital structure of any firm is the cumulative outcome of past attempts to time the equity market (Baker and Wurgler, 2002). Die Bie and de Haan (2007) find evidence of market timing in a sample of Dutch listed firms, however, do not find persistent effects of the marketing theory on the capital structures of Dutch firms. Bougatef and Chichti (2010) find evidence supporting this theory in their study using a panel of French and Tunisian listed firms. In particular, the study finds that firms tend to

issue equity when their market valuations are higher than their book values and results in firms becoming underleveraged in the short-term.

Bruinshoofd and de Haan (2012) find that UK and European firms tend to hold more closely to the pecking theory and that market timing does not hold. Baxamusa (2011) finds that firms do in fact time the market by issuing equity when the firm's stock is over-valued.

2.7 The "Bird-in-hand" Theory

The bird-in-hand theory was developed by both Gordon (1959) and Lintner (1962). Gordon (1959) and Lintner (1962) proposed that investors prefer dividends today, as opposed to capital gains at some time in the future, i.e., the bird-in-theory. Graham (1934) developed screening measures in order to value a firm by drawing a connection between dividends paid and share value which Gordon (1959) and Lintner (1962) later expanded on by proposing that a firm can be valued based on its dividend pay-out ratio as per equation (7) above.

Black and Scholes (1973) later explored this concept further by introducing taxes into the model proposed by Gordon (1959) and Lintner (1962). With the introduction of taxes into the growth model, Black and Scholes (1973) found that the share value is independent of the dividend pay-out ratio, as dividend taxes are higher than taxes levied on capital gains. The effect of taxation on dividends results in the need for investors to manage the tax burdens on investments to coincide with the investor's individual requirements (Black and Scholes, 1973). Miller (1986) expanded on the Black and Scholes' (1973) model by stating that due to the tax disadvantages of dividends, firms should use excess funds to invest in profitable real investment opportunities, and when all such options have been exhausted, they should use any excess funds to repurchase shares. Thereby managers can avoid dividend taxes in the hands of individual investors, as well as increase shareholder wealth. Miller (1986) went on to assert that firms under the dividend pay-out model are failing to create shareholder wealth by not converting highly taxed dividends into low taxed capital gains.

The findings of the empirical research conducted by Black and Scholes (1973) as well as Miller (1986) both prove that dividend pay-out ratios, in the presence of taxes, are not relatable to the value of the individual share as the dividends paid will be taxed in the hands of the individual investors at the marginal income tax rate, thereby removing any added value of "a bird in the hand is worth two in the bush" due to the higher tax rates associated with dividend pay-outs.

Black and Scholes (1973) find that an investor who is trying to maximise his expected after-tax return for a given level of risk may ignore dividends and concentrate instead on improving his portfolio diversification. It is much more likely that he can reduce his risk by improving his diversification than that he can increase his expected return by emphasising stocks with a given level of dividend yield.

2.8 Capital structures in South Africa

Antoniou, Guney and Paudyal (2008) in their study of firms operating in market-orientated economies (i.e. the United Kingdom, the United States, France, Germany and Japan) make reference to the relevance of industry effects on firm financing decisions. As such thought needs to be given the factors and industry effects that define the South African business environment in which firms operate as previously mentioned.

The South African market presents a difference to most markets in that the ownership structures in South Africa are highly concentrated with most firms owned by the same powerful shareholders (Kantor, 1998). In addition to this, the South African economy underwent a major regime change in the early 1990's which changed the way in which firms approached financing decisions (Chipeta, Wolmarans and Vermaak, 2012). Chipeta *et al*. (2012) study the effects of the liberalisation of the South African economy on 70 JSE listed non-financial firms for a period from 1989 to 2007 and find evidence supporting the trade-off theory in South African listed non-financial firms. In addition to this, South African firms tend to make use of non-debt tax shields in order to lower their effective tax rate. Chipeta *et al*. (2012) examined the dynamics of corporate capital structures for JSE listed non-financial firms in South Africa and found that the listed non-financial firms in South Africa do in fact adjust towards a target optimal capital over time.

Despite the differences in the South African market, the findings of Chipeta *et al*. (2012) show that South African firms do follow similar financing theories that are currently being deployed in the developed markets. In addition to this, in terms of capital budgeting Correia and Cramer (2008) conduct a sample survey to determine and analyse the corporate finance practices of South African listed companies in relation to the cost of capital, the capital structure that the firm employs and the capital budgeting decision process. Despite the difference in ownership structures, Correia and Cramer (2008) find that most practices of the South African corporate sector, despite the uniqueness of the South African market, are in line with practices employed by companies listed in the United States of America.

Fosu (2013), in support of the findings of Kantor (1998), finds that concentrated and pyramid type ownership structures define the South African Market and this distinguishes the South African Market from other markets. This concentrated and pyramidal structure creates unique agency problems in that the conflict is not necessarily between owners and managers as would be faced in a "normal" scenario but between minority and majority shareholders. As such, Fosu (2013) states that the covenants associated with debt can help mitigate this cost. Debt, as envisaged by Fosu (2013), takes the form of long term debt, as long term debt is the most likely to carry the restrictive covenants that would mitigate the costs associated with the agency cost theory. This is supported by Chang, Lee and Lee (2009) who find that long term debt is the most important proxy of capital structure, this is followed by short-term debt and then convertible debt. Matemilola, Bany-Ariffin and Azman-Saini (2012) examined the capital structures of all South African listed firms (excluding financial firms) in a study comparing the relationship between leverage and the shareholder's required return and find that long term debt is positively related to the shareholder's returns.

Despite the findings of the research studies referenced above, Chipeta *et al*. (2012) find that South African firms tend to avoid debt in order to mitigate the underinvestment problem associated with financial difficulty. On the other hand, Gwatizdo and Ojah (2009) find that African firms tend to rely heavily on internal finance and when they use external finance, the firms tend to rely on short-term debt to fund their operations. This evidence

supports the pecking order theory. In addition to the differences in the South African market discussed above, Aghion, Braun and Fedderke (2008) find that there are reduced levels of competition in the South African market. They find that mark-ups are significantly higher in the South African manufacturing industries than they are in corresponding industries worldwide, this is as a result of lower competition levels in the South African manufacturing industry. Aghion *et al*. (2008) are supported by the findings of Fedderke and Simbanegavi (2008).

As the various studies referenced above show that the South African market is characterised by firms that adjust to a specific target capital structure over time there is support for an optimal target ratio in South Africa. In addition to the support for the trade-off theory in the South African market, Correia and Cramer (2008) assert that South African firms tend to use discounted cash flow models to evaluate the viability of projects. As the discounted cash flow technique makes use of a discount rate, thought needs to be given to the discount rate that South African firms employ, as the capital structure of a firm directly feeds into the discount rate that is used in the discounted cash flow model. The rate that is employed is called the Weighted Average Cost of Capital (WACC) of a firm can be determined by applying the following formula:

$$WACC = w_d r_d(1 - T) + w_{ps} r_{ps} + w_{ce} r_{ce} \quad (8)$$

Where:

w_d = weight of any debt included in the capital structure

w_{ps} = weight of any preference shares included in the capital structure

w_{ce} = weight of any common shares included in the capital structure

r_d = required rate of return of any debt included in the capital structure

r_{ps} = required rate of return of preference shares included in the capital structure

r_{ce} = required rate of return of any common shares included in the capital structure, and

T = corporate tax rate

As can be seen from the above, the firms WACC is determined by the cost and weighting of equity, the cost and weighting of debt employed and the prevailing corporate tax rate. As a result, the firms WACC is a trade-off (as suggested by the static trade-off theory) between the risings cost of equity as default risk increases and the rising cost of debt (again as default risk increases).

To minimise the WACC (Refer to Baumol and Malkiel, 1967) with reference to an optimal capital structure and minimising the WACC), a firm needs to establish its implied cost of equity (rate at which the firm's shareholders discount the cash flows due to each individual shareholder) and the cost of debt. An increase in risk is likely to be reflected in both the cost of debt and equity. Damodaran (2015) states that debt and equity are claims on the same underlying assets and as a result specific characteristics that influence distress risk are likely to be reflected in both the cost of equity and the cost of debt.

The Implied Cost of Equity is defined as the discount rate that equates the present value of expected future earning streams to the current market price of equity and is the inverse of any appropriate equity valuation model. The frequently used valuation models in the literature are the residual income valuation modules of Claus and Thomas (2001) and Gebhardt, Lee, and Swaminathan (2001) as well as the abnormal earnings growth valuation models of Ohlson and Juettner-Nauroth (2005) and Easton (2004). Guay, Kothari, and Shu (2011) find that there is no absolute solution for the implied cost of equity, as a result this study will use the Return on Equity generated year on year as the cost of equity employed and assumes that any differential between the implied cost of equity and return on equity has already been priced into the share price of the JSE listed South African IT firms. Kiyotaki and Moore (1997) show how increases in corporate leverage lead to higher costs of external financing due to a higher default probability. This is supported by Van Breda (2007), who calculates the probability of default of the top 42 non-financial South African firms, and shows that Merton's (1974) model can be used as a source of information on the underlying credit risk of JSE listed South African firms.

In order to proceed with the WACC and the rising cost of capital, the relationship between debt and equity and proxy for the risk premium attached to the firm needs to be

established. Ita (2015) and Vassalou and Xing (2004) prove a positive relationship between the cost of debt and equity, using an implied cost of equity and credit default swaps (CDS) (Refer to Campello, Chen, and Zhang, 2008) for further research conducted on the relation of CDS spreads to equity risk premiums). A Credit Default Swap can be defined as a credit derivative instrument which transfers the credit risk of debt from one party to another (Damodaran, 2016), and has been used in numerous studies as a proxy for risk premium on a firm's debt. See Griffin and Lemmon (2002), Chava and Purnanadam (2010) and Fama and French (1993) for debt risk premiums and cost of equity and Friewald, Wagner and Zechner (2014) and Barone-Adesi and Brughelli (2010) for CDS as a measure of default risk.

In contrast to the findings of Ita (2015) and Vassalou and Xing (2004), Dichev (1998), Campbell, Hilscher, and Szilagyi (2008) find that there is a negative relationship between the firm's default risk and its return on equity, while Avramov, Chordia, Jostova and Philipov (2009) argue low return on equity values associated with high levels of default risk is more pronounced for lower quality equity. Anginer and Yildizhan (2010) again find that a firm's default risk is not priced into the cost of equity. For attempts to reconcile the conflicting findings see Garlappi, Shu, and Yan (2008), and Garlappi and Yan (2011).

Mahrt-Smith (2005) in his paper comparing the effects of interaction of capital structure and ownership structure predicts the following:

1) Strong, concentrated equity ownership is associated with strong, concentrated debt holdings (this does not seem to hold true in South Africa as Chipeta *et al*. (2012) and Gwatizdo and Ojah (2009) found);
2) If long term specific investments are important, then the equity should be more dispersed (for a given debt structure);
3) Board representation by banks is desirable;
4) Environments with weak bankruptcy procedures may be associated with relatively dispersed equity ownership structures and conversely, environments with tough bankruptcy procedures may be associated with relatively concentrated equity ownership patterns.

Tough debt covenants may be more prevalent in environments that also favour large equity holders (Mahrt-Smith, 2005).

Merton (1974) states that the value of a particular issue of debt depends essentially on three items:

1) The required rate of return on riskless debt (government bonds or very high grade corporate bonds);
2) The various provisions and restrictions contained in the indenture (maturity date, coupon rate, call terms, seniority in the event of default, sinking fund etc.);
3) The probability that the firm will default (Merton, 1974).

For the purposes of this paper, we will focus on the rising CDS spread as the firms default risk increases. Ita (2015) shows that a CDS can be used as a proxy for the risk premium associated with each particular firm, i.e. the marginal cost of debt for any particular firm is equal to the risk free rate plus the relevant CDS value.

2.9 Earnings per Share (EPS)

Earnings per Share (EPS) is the most basic measure of earnings available to common shareholders and as a result makes the use of EPS an easy measure to represent the wealth maximisation for shareholders. EPS is calculated by dividing the earnings available to common shareholders by the number of common shares outstanding at the end of the period (Brigham and Davies, 2007).

Ohlson and Juettner-Nauroth (2005) and Ohlson (2000) presented a firm valuation model based on expected earnings per share and how earnings per share translates into shareholder wealth. Valuation according to EPS is based on the present value of expected dividends model (Gordon Lintner growth model) (Ohlson, 2000). The basis for this is the assumption that the firm will attempt to grow its earnings per share year on year assuming no new shares are issued (i.e. the firm will attempt to grow its Net Income line year on year).

The introduction of debt into the capital structure not only increases the firm's EPS through lessening the number of shares outstanding in relation to the total capital invested in a firm (debt and equity) but also maximises shareholder wealth by increasing the value of the firm. Ohlson and Juettner-Nauroth (2005) state that EPS growth rather than DPS growth provides a better core for the Gordon growth model. Further, Friewald, Wagner and Zechner (2014) find that firms stock returns increase with credit risk premiums as estimated from CDS spreads, this is consistent with theory and follows on from Merton (1974).

Due to the support for the trade-off theory in the South African market, and similar to the findings of Correia and Cramer (2008) Damodaran (2015) and Friewald, Wagner and Zechner (2014); the earnings per share (EPS) of South African listed firms (in conjunction with the firm's return on equity) will be used as a measure and or proxy representing the maximisation of shareholders' wealth.

Chapter Three: Research Methodology

As previously stated, the general objective of this study is to investigate the capital structures employed by JSE listed South African IT firms. The purpose of ascertaining the capital structures of JSE listed South African IT firms was to compare and contrast these to the capital structures employed by the JSE Top40 non-IT firms (excluding financial services). In addition, the capital structures of the JSE listed South African IT firms are compared to the capital structures employed by NASDAQ listed US IT firms in a comparative study.

The specific objectives are of the study are:

- To determine how the capital structures of JSE listed South African IT firms differ from the capital structures of all non-IT firms (excluding financial services) in the JSE Top40.
- To determine how the capital structures of JSE listed South African IT firms differ from those sampled from US IT firms listed on the NASDAQ.
- To determine if the capital structures of the sample firms and the Return on Equity have a relationship.
- To determine if composition of the debt of the firm split between long term debt and short term debt make a difference to the effect on the firm's Return on Equity.
- To determine whether there is a relationship between the capital structure and earnings per share (EPS) of JSE listed South African IT firms, and NASDAQ listed US firms.

As previously stated the study attempts to answer the following questions:

1. Does a relationship exist between the Total Debt Ratio and Return on Equity? And if so, what is the strength of this relationship?
2. Does a relationship exist between the Long Term Debt to Total Debt ratio and the Return on Equity Ratio? And if so, what is the strength of this relationship?
3. To what extent (if any) does a relationship exist between the firm's Return on Equity and its Earnings per Share? And if a relationship does exist, what is the strength of the relationship?

4. Does a relationship exist between the Times Interest Earned Ratio and the Long Term Debt to Total Debt ratio? And if a relationship does exist, what is the strength of the relationship?
5. Does a relationship exist between the firm's Earnings per Share and its Long Term Debt to Total Debt Ratio? And if a relationship does exist, what is the strength thereof?

3.1 Research Design

The research was designed in such a way that there is sufficient data in order to draw a comparison between firms and geographical locations such that the research objectives may be addressed. Furthermore, the research design was created and selected in such a manner as to ensure that the collection of data is credible, affordable and reliable, thereby ensuring the integrity of the research.

All of the data used in this study were obtained from iNet BFA and Bureau van Dijk (provider of live and historical financial and economic statistics – these data comprised South African equities and United States of America equities listed on the NASDAQ stock exchange).

The research design is quantitative in nature using a ratio analysis in order to arrive at measures of gearing and profitability for the respective geographic locations and makes use of standard deviation, frequency distributions and mean numbers to make inferences about the population.

The samples that were compared consist of three groups of firms, namely, all JSE listed South African IT firms, and the JSE Top40 at a static point in time, excluding financial services (as of 01 January 2009), as well as a sample of NASDAQ listed US IT firms.

Assumptions to be applied:

1) If the firm is listed on the Johannesburg Stock Exchange, it is assumed that the firm is a South African firm.

2) All debts listed on the firm's balance sheet of JSE listed firms are denominated in South African Rand (ZAR).
3) The difference in base currency between the JSE listed South African firms and that of the NASDAQ listed US firms is negated by the fact that each ratio is calculated in the particular firm's base currency and comparison is made on a ratio basis and not relative value basis.
4) The financial markets of the United States of America and South Africa are well developed and highly liquid markets that allow for easy movement of capital (as has been evidenced in the studies quoted elsewhere in this study).
5) All interest expenses incurred as a result of long term debt is deemed to be interest incurred in the production of income for tax purposes (This assumption allows for the removal of any difference in treatment of interest expense as a result of a difference in tax law between the South African Revenue Service and the Internal Revenue Service).

3.2 Variables to be measured

The research approach that was pursued in achieving the research objectives is quantitative in nature. Descriptive statistics, through data analysis in Microsoft Excel, was used to analyse the annual financial statements of nine JSE listed South African IT firms, all JSE Top40 firms (excluding the financial services sector, as determined at a static point in time (January 2009, refer to section 4.2.2 for further details.) and a sample of 27 NASDAQ listed US IT firms over a period of five (calendar) years from January 2009 to December 2014, using the ratios as described in Table 3.1.

Table 3.1: Ratios to be used as part of the analysis

Ratio to be used	**Formula**	**Test**
Debt Management		
DR	$\frac{TL}{TA}$	Indicates the percentage of a firm's assets that have been financed with debt. The ratio consists of total debt to total assets.
LTDTD (Refer to Korajczyk and Levy, 2003 for a study using a similar methodology)	$\frac{LTD}{TD}$	A measure representing the percentage of the firm's obligations that last for more than one year.
Profitability		
ROE	$\frac{\mathrm{NI}}{\mathrm{TE}}$	Measures the rate of return of common shareholders.
EPS	$\frac{NI}{ASO}$	A portion of a firm's earnings attributed to each outstanding common share.
Debt Serviceability		
TIE	$\frac{EBIT}{IE}$	Measures a firm's ability to repay its debt obligations as they come due.

Source: Compiled by author.

This analysis was performed on an annual frequency basis by using five ratios describing the firms debt management, profitability and debt serviceability and four ratios to adjust for firm-specific variables which describe both the capital structure and profitability of each firm from financial information obtained from the annual financial statements of the respective firms, INET BFA and Bureau van Dijk.

The purpose of the ratio analysis is to describe the current capital structures that each firm has employed. What the debt mix of each respective firm consists of by examining the mix of short term and long term debt as a percentage of the firm's total debt. As this study focuses on the wealth creation for a firm's shareholders, profitability will be measured by

each firm's respective return on equity and the earnings per share of each firm included in the sample.

Each ratio was selected with a specific purpose in mind and was divided into two specific groups. As the study is attempting to understand the capital structures employed by JSE listed IT firms, the current capital structure of each firm needed to be investigated, as such ratios that test the capital structure employed by firms in the sample were calculated and provided the researcher with insight into the current capital structures employed. In addition to the current capital structures that the firms in each respective sample have employed, measures of profitability needed to be measured for each firm given their level of debt. This was done in order to further the investigation of the firm's capital structure by investigating the relationship (if any) between the capital structures and profitability of the firms included in the sample.

3.2.1 Capital Structure Ratios

Two ratios were selected to measure the capital structures of the firms included in the sample, namely the debt ratio and the long term debt to total debt ratio. The rationale for the selection of the ratio will be further expanded upon in the sections that follow.

Debt Ratio:

The debt ratio as described above provides an insight into the mix of debt and equity that a firm has employed in order to fund its operations and provides a degree of leverage for each firm. It was included as a metric to be measured as this ratio is uniquely capable of providing insight into the level of debt that the firm has employed at a static point in time (measured as at the end of each firm's respective financial year end).

The financial information to be included in the calculation is drawn directly from the firm's annual financial statements, in that the Total Liabilities line item on the Statement of Financial Position for Year Ended is divided by the Total Assets line item on the same statement.

Long Term Debt to Total Debt Ratio:

As a firm's debt can take either the form of short term payables or long term liabilities the long term debt to total debt ratio was included in order to further explain the mix of debt employed. The long term debt to total debt ratio provided further information on how the debt levels of each firm were constituted.

The metrics that were included in the calculation were all long term interest-bearing debt as disclosed on the Statement of Financial Position at Year Ended divided by the total debt as disclosed in the Statement of Financial Position. The long term debt to total debt ratio was included in order to provide insight into the tax savings that the firm is enjoying as a result of interest deductions (thus providing the basis for a regression analysis in order to describe the effect that leverage has on the profitability of the firm).

3.2.2 Profitability ratios

Once the results of the current capital structures of firms were obtained, measures of profitability needed to be calculated. As such two further ratios for probability were included in order to determine the level of profitability of each firm included in the same.

Return on Equity:

The return on equity ratio was included in order to calculate how well the firm is generating a return, and as a result, creating wealth for the shareholders. The metrics that were included in the calculation for return on equity are the net income (income net of interest and taxes) number as reported in the Statement of Comprehensive Income and the total equity as reported in the Statement of Financial Position.

Earnings per Share:

As this study makes use of a discounted cash flow firm valuation technique, the firm's earnings per share were calculated. The earnings per share number was calculated as the firm's Net Income after Tax as reported in the Statement of Comprehensive Income divided by the number of ordinary shares outstanding. The earnings per share were included as a

measure of wealth creation for the shareholder based on a discounted cash flow model as presented by Ohlson (2000) and Ohlson and Juettner-Nauroth (2005).

3.2.3 Debt Serviceability Ratio

Times Interest Earned:

The Times Interest Earned ratio was included in order to quantify the sample firm's ability to repay its debt obligations for the year. The ratio is a measurement that will be used to calculate the default risk that the firm is facing, as proposed by Damodaran (2016).

The metrics to be included in the ratio are the Earnings before Interest and Taxes (EBIT) and the Interest expense number as reported in the Statement of Comprehensive Income.

3.2.4 Firm specific variables

Before the regression analysis was run, thought needed to be given to firm specific factors which influence profitability. The firm specific factors that were included in the regression analysis are:

1) Asset tangibility, defined as the firm's book tangible assets to total book assets
2) Firm size, defined as the natural log of total assets of the firm as reported in each firm's respective annual financial statements.
3) Existence of alternative tax shields, defined as depreciation and amortisation as disclosed in the Statement of Comprehensive Income as a percentage of total book assets.
4) Profitability, defined as net income to total book assets.

The firm specific variables have been included in Annexure D and have not been presented further in the paper as these variables are not the subject of this research. The presence of the firm specific variables has been included in order to further explain the capital structures that firms have employed and add further explanatory power to the regression analysis results.

3.2.5 Data Analysis

Once the required financial information and or data have been gathered and the financial ratios calculated, a frequency distribution, can be defined as a mathematical function showing the number of instances in which a variable takes each of its possible values (Tustin *et al*., 2005), has been constructed for each ratio within each of the following 3 categories:

1. JSE listed South African IT Firms.
2. The JSE Top40 South African Firms.
3. A sample of NASDAQ listed US IT Firms.

Three measures of central tendency have been applied to the frequency distribution:

1. Mean
    a. The sum of a set of values divided by their number (Tustin *et al*., 2005:538)
    b. This will be used to provide an approximate measure of central location for the data giving an indication of central location for the data set
    c. The weakness of this method is that the mean is affected by extreme values (outliers). As a result of this, the median will also be calculated for each dataset
2. Median
    a. Defined as the value above or below which one half of the observations fall (Tustin *et al.*, 2005:540)
    b. The advantage of this is that the median is not affected by extreme values (outliers) such as the mean.
3. Standard Deviation
    a. A measure of the range of values in a set of numbers. Standard deviation is a statistic used as a measure of the dispersion or variation in a distribution, equal to the square root of the arithmetic mean of the squares of the deviations from the arithmetic mean (Tustin *et al*., 2005:550).

3.2.6 Summary

The ratios as listed above were selected for the study in order to address the objectives and specific questions as previously mentioned. The results of the debt management ratios address the following specific objections of the study:

1) To determine how the capital structure of JSE listed South African IT firms differ from the capital structures of all non-IT firms (excluding financial services) in the JSE Top40.
2) To determine how the capital structures of JSE listed South African IT firms differ from those sampled from US IT firms listed on the NASDAQ.

The profitability and debt serviceability ratios were calculated in order to address the following specific objectives of the study:

- To determine whether the capital structure and EPS in JSE listed South African IT firms have a relationship.
- To determine if an optimal capital structure exists for a JSE listed South African IT firm.

Once the profitability ratios were calculated the relationship between the leverage ratios (long term debt to total debt) and profitability ratios needed to be assessed. This was done by conducting a regression analysis (the generalised method of moments regression model was used) in order to ascertain to what extent a relationship exists between capital structure and profitability for the firms included in the sample. The relationship between the return on equity ratios and the earning per share ratios were also investigated in order to allow for further inferences to be made regarding the optimal capital structures.

The capital structure, profitability and debt serviceability ratios and the inferences drawn from the regression analysis were key in assisting the researcher to address the questions of this study.

3.3 Sampling Method

In order to achieve the above-stated objectives, a suitable sampling method needed to be determined. The method that was applied to each sub category is expanded upon in each of the following sections.

3.3.1 South African JSE Listed IT Firms

South African Listed IT firms to be included in the sample will need to meet the following criteria:

1. The JSE listed firm must be involved in the IT industry.
2. The JSE listed firm must be South African.
3. The JSE listed firm must have sufficient financial information available, i.e. must have complete and reliable annual financial information for the period 2009 to 2014.

Nine firms fulfil all the above criteria requirements. The particular firms which fulfil the requirements can be found in Table 3.1.

3.3.2 JSE listed Top40 Firms

The JSE Top40 index consists of the 40 largest Firms listed on the JSE's main (listing) board (determined) by market capitalisation. Market capitalisation can be defined as the number of shares of a firm outstanding multiplied by the current share price. (Courtney Capital, n.d.). The JSE Top40 is a well-known, commonly used and respected index that is representative of the South African economy as a whole. Although the Top40 consists of only 40 of the 400 firms listed on the JSE, it accounts for 80% of the market capitalisation of all JSE listed firms (Courtney Capital, n.d.).

As the JSE Top40 is a constituent of firms that changes over time, the JSE Top40 index that was used is the Top40 Index as of 1 January 2009. This static point in time was used to determine the constituents representing the Top40 index for this study in order to create stability and comparability over the entire time span that the analysis includes.

For the purposes of this study, all financial services firms were removed from the Top40 index due to the regulatory controls that govern the capital structures of firms involved in the financial services.

3.3.3 NASDAQ Listed US IT Firms

A stratified random sampling method was used to create the sample for the NASDAQ listed US IT firms. Stratified random sampling separates the population into different subgroups and then selects random samples from each subgroup (Tustin et al., 2005). The sample was constructed in such a manner as to reflect the demographics of the population as a whole, i.e. a representative sample. The total population of NASDAQ listed US IT firms consists of 661 firms (as at 31 August 2015) as per data from van Dijk Bureau.

In order to qualify for inclusion in the sample, the NASDAQ listed firms need to meet the following criteria:

1. The NASDAQ listed firm must be a US entity.
2. The firms must have sufficient annual financial information available, i.e. must have complete and reliable financial information for the period 2009 to 2014.
3. The NASDAQ firms' primary business must be deemed to fall with the IT industry.

US firms listed on NASDAQ are categorised into the following categories:

- Advertising
- Computer Communications Equipment
- Computer Manufacturing
- Computer Peripheral equipment
- Computer software: pre-packaged software
- Computer software: Programming, Data processing
- Diversified Commercial Services
- EDP services
- Electrical Products
- Electronic components
- Industrial machinery/components

- Professional services
- Radio and television broadcasting and communications equipment
- Retail: computer software and peripherals equipment
- Semi-conductors
- Telecommunications Equipment.

Of the above named categories, the following categories relate directly to the IT industry:

- Computers Communications equipment (11 firms)
- Computer manufacturing (four firms)
- Computer peripheral equipment (13 firms)
- Computer software: Pre-packaged software (44 firms)
- Computer software: Programming, Data Processing (11 firms)
- Retail and Television Broadcasting and Communications Equipment (four firms).

Applying the criteria listed above to the population of NASDAQ listed firms (as per data from van Dijk Bureau) resulted in 87 firms that fully met the criteria requirements.

The strata (categories) that were used in the construction of the sample were as listed above. Using the stratified random sample method and building a representative sample of the population resulted in a sample size of 29 firms.

Table 3.2 presents the JSE listed South African IT firms that were included in this study's analysis using the selection and or sampling criteria specified for each 'sub-sample'. The sample contains three sub-samples: (i) JSE listed South African IT firms, (ii) JSE listed Top40 excluding financial services firms (as at 01 January 2009), (iii) NASDAQ listed US IT firms.

Table3.2: Details of firms making up the sample of JSE listed South African IT Firms

Firm	Number of Firm Years	Number of Firms in the Population	Number of Firms in the sample/the number of firms JSE listed South African IT firms
Adapt IT Holdings Ltd	**9**	**9**	**1**
Cognition Holdings Ltd	**9**	**9**	**1**
Datacentrix Holdings Ltd	**9**	**9**	**1**
Datatec Ltd	**9**	**9**	**1**
EOH Holdings Ltd	**9**	**9**	**1**
Huge Group Ltd	**8**	**9**	**1**
Jasco Holdings Ltd	**9**	**9**	**1**
Mustek Ltd	**9**	**9**	**1**
Pinnacle Hldgs Ltd	**9**	**9**	**1**

Source: compiled by author

Table 3.3 below presents the JSE Top40 (excluding financial services) firms that have been included in the study. Table 3.4 presents the NASDAQ listed US IT firms that have been included in the sample.

Table3.3: Details of firms making up the sample of the JSE Top40 (as at 1 January 2009)

Firm	Number of Firm Years	Number of Firms in the Population	Number of Firms in the sample/the number of firms JSE Top40
ArcelorMittal South Africa Ltd	**9**	**27**	**1**
Anglo American	**9**	**27**	**1**
Anglo Platinum	**9**	**27**	**1**
Anglogold Ashanti	**9**	**27**	**1**
Aspen Pharmacare Holdings	**9**	**27**	**1**
African Rainbow Minerals Ltd.	**9**	**27**	**1**
BHP Billiton	**9**	**27**	**1**
Compagnie Financiere Richemont AG	**9**	**27**	**1**
Exxaro Resources	**9**	**27**	**1**
Gold Fields	**9**	**27**	**1**
Growthpoint Prop Ltd	**9**	**27**	**1**
Harmony	**9**	**27**	**1**
Impala Platinum Hlds	**9**	**27**	**1**
Kumba Iron Ore	**9**	**27**	**1**
Lonmin PLC	**9**	**27**	**1**
MTN Group	**8**	**27**	**1**
Naspers	**9**	**27**	**1**
Pick N Pay Stores	**9**	**27**	**1**
Pretoria Portland Cement	**9**	**27**	**1**
Remgro	**9**	**27**	**1**
SABMiller	**9**	**27**	**1**
Steinhoff International Holdings	**9**	**27**	**1**
Shoprite	**9**	**27**	**1**
Sasol	**9**	**27**	**1**
Tiger Brands	**9**	**27**	**1**
Telkom	**9**	**27**	**1**
Vodacom Group	**7**	**27**	**1**

Source: compiled by author

*excluding financial services (listed) companies

Table3.4: Details of firms making up the sample of NASDAQ listed US IT firms.

Firm	Number of Firm Years	Number of Firms in the Population	Number of Firms in the sample/the number of NASDAQ listed US IT firms
Adobe Systems Inc.	**5**	**87**	**0.3**
Allot Communications Ltd.	**5**	**87**	**0.3**
Ansys Inc.	**5**	**87**	**0.3**
Apple Inc.	**5**	**87**	**0.3**
Astro Med Inc.	**5**	**87**	**0.3**
Aware Inc.	**5**	**87**	**0.3**
Bottomline Technologies Inc.	**5**	**87**	**0.3**
Broadvision Inc.	**5**	**87**	**0.3**
China Digital TV Holding Co., Ltd.	**5**	**87**	**0.3**
Commvault Systems Inc.	**5**	**87**	**0.3**
Ingram Micro Inc.	**5**	**87**	**0.3**
Interactive Intelligence Group Inc.	**5**	**87**	**0.3**
Intuit Inc.	**5**	**87**	**0.3**
Lexmark International Inc.	**5**	**87**	**0.3**
Liveperson Inc.	**5**	**87**	**0.3**
Logmein Inc.	**5**	**87**	**0.3**
Manhattan Associates Inc.	**5**	**87**	**0.3**
Microstrategy Inc.	**5**	**87**	**0.3**
National Instruments Corp.	**5**	**87**	**0.3**
Progress Software Corp.	**5**	**87**	**0.3**
Rackspace Hosting Inc.	**5**	**87**	**0.3**
Radisys Corp.	**5**	**87**	**0.3**
Rosetta Stone Inc.	**5**	**87**	**0.3**
Sapiens International Corporation	**5**	**87**	**0.3**
Smith Micro Software Inc.	**5**	**87**	**0.3**
Synopsis Inc.	**5**	**87**	**0.3**
Take Two Interactive Software Inc.	**5**	**87**	**0.3**

Source: compiled by author

3.4 Data Collection

The data to be used consisted of secondary data that is freely available to the public through the annual financial statements of the firms to be included in this study and as identified through preliminary sampling. The required data was collected from the websites of the respective firms in the form of annual financial statements and or through data providers or vendors such as INET BFA, Bloomberg, and the van Dijk Bureau. Data providers or vendors, such as INET BFA, Bloomberg, and the van Dijk Bureau, collect, organise, archive and to some extent analyse (expand) financial and company data for easy and convenient access and use by end-users.

3.5 Regression Analysis

In order to draw inferences from the data collected on the sample, a regression analysis is necessary. Given that the data is compiled for three samples across five years, a panel data analysis was applied in order to make inferences from the data analysed and apply these to the general population.

The panel analysis method makes use of a linear regression using equation (5):

$$Y_i = a + bX_i s_i + e_i \quad (8)$$

Where:

Y_i = the corresponding dependent variable for X_i

a = the y intercept constant

b = the regression coefficient

X_i = the independent variable for any value *i*

s_i = independent variable adjusting for firm size, profitability, asset tangibility and the existence of non-debt tax shields.

e_i = the error term

b is calculated as per equation (9):

$$b = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sum(x_i - \bar{x})^2} \quad (9)$$

Where:

x_i = the value of the independent variable at *i*

$\bar{x}$ = average value of independent variable x

y_i = the value of the dependent variable at *i*

$\bar{y}$ = average value of dependent variable y

e*i* is calculated as per equation 10:

$$e_i = \sqrt{\frac{\sum(y_i - \hat{y}_i)^2}{N}} \quad (10)$$

Where:

y_i = the value of the dependent variable at *i*

$\hat{y}_i$ = the predicted value for x_i

N = the number of pairs of scores

s_i is calculated as per equation 8:

$$s_i = a_i . sz_i . pr_i . ts_i \quad (11)$$

Where:

a_i = asset tangibility

sz_i = firm size

pr_i = profitability

ts_i = size of non-debt tax shields.

The objective of the regression analysis was to answer the following questions:

1. Does a relationship exist between the Total Debt Ratios and Return on Equity? If so, what is the strength of this relationship?

The regression was calculated using the total debt ratio as the independent variable and the return on equity ratio as the dependent variable.

2. Does a relationship exist between the Long Term Debt to Total Debt ratio and the Return on Equity Ratio? And if so, what is the strength of this relationship?

The linear regression was conducted using the long term debt to total debt ratio as the independent variable and the return on equity as the dependent variable.

3. To what extent (if any) does a relationship exist between the firm's Return on Equity and its Earnings per Share? And if a relationship does exist, what is the strength of the relationship?

4. Does a relationship exist between the Times Interest Earned Ratio and the Long Term Debt to Total Debt Ratio? And if a relationship does exist, what is the strength of the relationship?

The relationship was tested for the above 2 ratios by applying equations (9), (10) and (11).

5. Does a relationship exist between the firm's Earnings per Share and its Long Term Debt to Total Debt Ratio? And if a relationship does exist, what is the strength thereof?

As stated, the regression analysis allows for inferences to be drawn from the data that was collected and applied to the population as a whole. As such the regression analysis is used for the next stage of the research namely:

- To determine if an optimal capital structure exists for a JSE listed South African IT firm.

The results of the data collection and regression analysis are presented in Chapter Four.

Chapter Four: Data, Results and Discussion

Introduction

Chapter Three presented the research methodology and the rationale for undertaking the research using a quantitative approach. Chapter Four presents the data analysis and results of the investigation on the capital structures of JSE listed South African IT firms, JSE listed Top40 and a sample of NASDAQ listed US IT firms.

The first section explores the descriptive statistics of the combined data of all three data sets. The findings for the Debt Ratio, Long Term Debt as a percentage of Total Debt, Return on Equity, Earnings per Share and the Times Interest Earned ratio are presented in sections 4.1 to 4.5. In addition to this, the section will also present the descriptive statistics outputs for the firm size, profitability, asset tangibility and the non-debt tax shields.

The second section covers the JSE listed South African IT firms and explores the Debt Ratio, Long Term Debt as a percentage of Total Debt, Return on Equity, and Earnings per Share and Times Interest Earned ratio. In addition to this, the section will also present the descriptive statistics outputs for the firm size, profitability, asset tangibility and the non-debt tax shields. The section will present the trends discovered over the time period.

Section three covers the data collected on the JSE Top40 and presents the analysis of the Debt Ratio, Long Term Debt as a percentage of Total Debt, Return on Equity, Earnings per Share as well as the Times Interest Earned Ratio. The section also presents the descriptive statistics outputs for the firm size, firm profitability, asset tangibility, and the non-debt tax shields and discusses the trends found over the sample period.

Section four presents the data and analysis on the sample of NASDAQ listed US IT firms and discusses the findings in relation to the Debt Ratio, Long Term Debt as a Percentage of Total Debt Ratio, Return on Equity, Earnings per Share and Times Interest Earned Ratio. The findings of firm size, profitability, asset tangibility and the non-debt tax shields, along with the trends found over the sample period are discussed.

The findings of the unit root tests, as well as that of the cross sectional dependence tests as described in Chapter Three, will be dealt with in section five. Section six presents the regression analysis using the GMM method as described in Chapter Three and discusses the regression outputs in relation to the five questions raised relating to ratio correlation.

4.1 All Data Statistics

The data from the three samples, namely the JSE listed South African IT firms, JSE Top40 as well as NASDAQ listed UD IT firms were combined in order to conduct tests of correlation; unit root tests and cross sectional dependence tests.

The data for the whole data set (i.e. combined observations for JSE listed South African IT firms, JSE Top40 as well as NASDAQ listed US IT firms are presented in Table 4.1 below:

Table 4.1: All data statistics

	ASSET	DEBT	EPS	FS	ICR	LTL	NOND	ROA	ROE
Mean	0.66809	0.4272	493.180	21.8958	45.7066	0.2205	0.04157	0.13694	0.09849
Median	0.89322	0.3800	17.1500	22.0306	6.10850	0.1363	0.02883	0.07508	0.11172
Maximum	1.53964	1.1400	6016.00	26.3590	5103.48	0.9207	1.53964	15.1900	1.25170
Minimum	-0.10060	0.0400	-562.00	13.2883	-1088.9	0.0000	-0.1006	-7.8500	-4.8365
Std. Dev.	0.38637	0.2329	986.43	2.74757	345.417	0.2379	0.0928	1.0913	0.41017
Skewness	-0.7471	0.6427	2.9904	-0.4799	11.7360	0.84088	13.714	8.50751	-6.4761
Kurtosis	1.9479	2.7496	13.1316	2.7184	162.308	2.6341	220.08	136.44	75.035
Jarque-Bera	43.137	22.153	1787.93	12.927	334930.	38.262	6184220	2337439	69192.
Probability	0.0000	0.0000	0.00000	0.0015	0.00000	0.0000	0.0000	0.0000	0.0000
Sum	207.10	132.45	152886.	6787.7	14169.0	68.361	12.889	42.451	30.534
Sum Sq. Dev.	46.129	16.774	3.01E+	2332.69	3686771	17.4929	2.66502	368.055	51.9878
Observations	310	310	310	310	310	310	310	310	310

4.1.1 Debt Ratio

The average total debt ratio across all three samples is 42.73% and has a median of 38% with a range of 4% to 114%. The data is positively skewed around the mean with a skewness of 0.642739 and is platykuric with a kurtosis of 2.749648. The data has a standard deviation of 23.3%.

4.1.2 Earnings per Share

The data for Earnings per share has a mean of 493.18 and a median of 17.15. The data ranged from a minimum of -562 to a maximum of 6016 with a standard deviation of 986.4312. The data has a skewness of 2.990404 and kurtosis of 13.13168. Given the range of the data and the large difference between the mean and the median, it is likely that the mean was affected by large outliers in earnings per share.

4.1.3 Long Term Debt as a Percentage of Total Debt

The combined samples have a mean of 22.05% and a median of 13.64%. The range of data was a minimum of 0% to a maximum of 92.07% with a standard deviation of 23.79%. The data is positively skewed around the mean and has a kurtosis of 2. 634105.

4.1.4 Return on Equity

The return on equity data has a mean of 9.85% and a median of 11.17%. The data range is -483.65% to 125.17% with a standard deviation of 41%. The data is negatively skewed around the mean with a skewness of -6.476178 and kurtosis of 75.03536.

4.1.5 Times Interest Earned Ratio

The mean times interest earned ratio for the combined three samples was 45.71 and had a median of 6.11. The times interest earned ratio has a large range with a minimum of -1088.92 and a maximum of 5103.48. The data has a standard deviation of 345.42. The data is positively skewed around the mean with a skewness of 11.73601 and has a kurtosis value of 162.3084.

The Return on Assets (profitability), Firm size, Asset Tangibility and existence of Non-debt tax shields will be discussed at the cross section sample level in the sections to follow as these variables represent a control for the regression analysis. Applying the Pearson Moment Correlation test to the data in Table 4.1 returned the results presented in Table 4.2:

Table 4.2: Pearson Moment Correlation

PEARSON MOMENT CORRELATION
Covariance Analysis: Ordinary
Sample: 1 315
Included observations: 310
Balanced sample (listwise missing value deletion)

Correlation Probability Observations	ASSET	DEBT	EPS	FS	ICR	LTL	NOND	ROA	ROE
ASSET	1.000000 ----- 310								
DEBT	-0.108401 0.0566 310	1.000000 ----- 310							
EPS	0.310636 0.0000 310	-0.146039 0.0100 310	1.000000 ----- 310						
FS	0.310896 0.0000 310	0.112463 0.0479 310	0.521041 0.0000 310	1.000000 ----- 310					
ICR	0.057493 0.3130 310	-0.030643 0.5909 310	-0.018002 0.7522 310	-0.235453 0.0000 310	1.000000 ----- 310				
LTL	0.263913 0.0000 310	0.198316 0.0004 310	0.289024 0.0000 310	0.617767 0.0000 310	-0.096780 0.0889 310	1.000000 ----- 310			
NOND	0.046016 0.4195 310	-0.081873 0.1504 310	-0.020469 0.7196 310	-0.036682 0.5199 310	-0.022257 0.6963 310	-0.025066 0.6602 310	1.000000 ----- 310		
ROA	0.058559 0.3041 310	-0.038417 0.5004 310	0.177084 0.0017 310	0.093681 0.0997 310	0.011441 0.8410 310	0.027696 0.6271 310	-0.101375 0.0747 310	1.000000 ----- 310	
ROE	0.052380 0.3580 310	-0.047767 0.4020 310	0.233862 0.0000 310	0.098412 0.0836 310	0.030609 0.5914 310	-0.079239 0.1640 310	-0.331399 0.0000 310	0.141729 0.0125 310	1.000000 ----- 310

The Pearson Moment Correlation tests the data for linear correlation between two variables. The null hypothesis states that there is zero linear correlation between variables, the alpha (significance level) used to determine significance is 0.05, should the p-value of a specific pair of variables exceed the alpha, the null hypothesis can be accepted. Using the Pearson Moment Correlation test to provide insight into the data and particularly the questions as outlined in Chapter Three:

1. Does a relationship exist between the Total Debt Ratios and Return on Equity? And if so, what is the strength of this relationship?

The p-value for the correlation test between the total debt and return on equity ratio was 0.402, thus the null hypothesis is accepted. There is no linear relationship between the total debt and return on equity ratios.

2. Does a relationship exist between the Long Term Debt to Total Debt ratio and the Return on Equity Ratio? And if so what is the strength of this relationship?

The correlation test between the long term debt to total debt and the return on equity ratio returned a p-value of 0.1640 as such the null hypothesis is accepted with no linear relationship existing between the two ratios.

3. To what extent (if any) does a relationship exist between the firm's Return on Equity and its Earnings per Share? And if a relationship does exist, what is the strength of the relationship?

Based on the Pearson Moment Correlation test, the p-value for ROE to EPS is 0.0000, as a result, the null hypothesis can be rejected. A positive linear relationship of 23.4 % exists between a firm's return on equity and its earnings per share.

4. Does a relationship exist between the Times Interest Earned Ratio and the Long Term Debt to Total Debt Ratio? And if a relationship does exist, what is the strength of the relationship?

The p-value for the relationship between the times interest earned ratio and the long term debt to total debt ratio is 0.0889, as a result, the null hypothesis is accepted at the 5% significance level and no linear relationship exists between the two variables.

5. Does a relationship exist between the firm's Earnings per Share and its Long Term Debt to Total Debt Ratio? And if a relationship does exist, what is the strength thereof?

The Pearson Moment Correlation test for the earnings per share and long term debt ratio to total debt ratios returned a p-value of 0.000. The null hypothesis can thus be rejected, the coefficient for the test (value of 0.289024) shows a significant positive relationship of 29% between the two variables.

Applying the Spearman Rank-Order Correlation test to the data presented in Table 4.1 yields results as per Table 4.3 below:

Table 4.3: Spearman Rank-Order Correlation

SPEARMAN RANK-ORDER CORRELATION
Covariance Analysis: Spearman rank-order
Sample: 1 315
Included observations: 310
Balanced sample (listwise missing value deletion)

Correlation Probability Observations	ASSET	DEBT	EPS	FS	ICR	LTL	NOND	ROA	ROE
ASSET	1.000000 ----- 310								
DEBT	-0.307930 0.0000 310	1.000000 ----- 310							
EPS	0.349026 0.0000 310	0.073590 0.1963 310	1.000000 ----- 310						
FS	0.276153 0.0000 310	0.080532 0.1572 310	0.714543 0.0000 310	1.000000 ----- 310					
ICR	0.119883 0.0349 310	-0.097926 0.0852 310	0.307281 0.0000 310	0.027791 0.6260 310	1.000000 ----- 310				
LTL	0.204596 0.0003 310	0.209340 0.0002 310	0.539836 0.0000 310	0.723601 0.0000 310	-0.118520 0.0370 310	1.000000 ----- 310			
NOND	-0.154156 0.0065 310	-0.060337 0.2896 310	0.018781 0.7419 310	0.180249 0.0014 310	0.040771 0.4745 310	0.127918 0.0243 310	1.000000 ----- 310		
ROA	0.116092 0.0411 310	0.192873 0.0006 310	0.585050 0.0000 310	0.209696 0.0002 310	0.560185 0.0000 310	0.137431 0.0155 310	-0.003240 0.9547 310	1.000000 ----- 310	
ROE	0.110952 0.0510 310	0.185111 0.0011 310	0.538243 0.0000 310	0.171277 0.0025 310	0.546998 0.0000 310	0.083419 0.1428 310	0.052010 0.3614 310	0.896911 0.0000 310	1.000000 ----- 310

The Spearman Rank-Order Correlation tests the data for a monotonic relationship (non-linear) between two variables. Applying the results of the Spearman Rank-Order Correlation test to the same five questions used with the Pearson Moment Correlation:

1. Based on the Spearman Rank-Order Correlation test, the p-value for the test between the firm's ROE and its total debt ratio is 0.0000. The null hypothesis can be rejected. The test indicates a positive relationship between ROE and the total debt ratio with a coefficient of 0.185111.
2. The p-value for the correlation test between the long term debt to total debt ratio and the firm's return on equity returned a value of 0.1428. The null hypothesis is therefore accepted, there is no monotonic relationship between the two variables.
3. The p-value for the correlation test of whether a monotonic relationship exists between the firms ROE and EPS is 0.0000. The null hypothesis is rejected, a positive monotonic relationship with a coefficient of 54% exists between the two variables.
4. The times interest earned and long term debt to total debt ratio returned a p-value of 0.0370 and a coefficient of -0.118520. As the p-value is less than the alpha (0.05) the null hypothesis is rejected, a negative monotonic relationship exists between the two variables.
5. The correlation test for the long term debt to total debt and EPS returned a p-value of 0.0000. The null hypothesis can be rejected, a strong monotonic relationship of 53.98% exists between the firm's EPS and its long term debt to total debt ratios.

Based on the Pearson Moment Correlation and the Spearman Rank-Order Correlation test, we are able to arrive at the following conclusions to the five questions presented in Chapter Three:

1) While the Pearson Moment Correlation test accepted the null hypothesis the Spearman Rank-Order rejected the null hypothesis. Despite the fact that no linear relationship exists it is confirmed that a positive monotonic (non-linear) relationship does exist between the two variables.
2) Both correlation tests accepted the null hypothesis that there is no relationship between the long term debt to total debt and total debt ratios. Therefore no

relationship exists between the two variables in the sample set based on the Pearson Moments Correlation and Spearman Rank-Order Correlation test.

3) Both a linear and monotonic relationship exists between a firm's ROE and its EPS. With both tests rejecting the null hypothesis and indicating a positive relationship.
4) The Pearson Moment Correlation test accepted the null hypothesis that no linear relationship exists between the long term debt to total debt ratio and a firm's total debt ratio. The Spearman Rank-Order Correlation test rejected the null hypothesis and indicated a negative monotonic relationship between the two variables.
5) Both correlation tests rejected the null hypothesis for a firm's EPS to its long term debt to total debt ratio. Both a positive linear relationship and a positive monotonic relationship exists between the variables for a firm.

4.2 JSE Listed South African IT Firms

The data for JSE listed South African IT firms are summarised as per Table 4.4 below.

Table 4.4: JSE listed South African IT firms

	ASSET	DEBT	EPS	FS	ICR	LTL	NOND	ROA	ROE
Mean	0.818863	0.633111	95.90644	19.47333	194.3031	0.099091	0.016220	0.121780	0.138278
Median	0.887705	0.650000	45.60000	20.44157	8.950000	0.049100	0.010000	0.141100	0.186200
Maximum	0.977776	1.030000	446.6000	22.46128	5103.480	0.464900	0.050000	0.313800	0.350100
Minimum	0.368486	0.180000	-15.30000	13.28831	-6.260000	0.000000	0.010000	-0.119400	-0.487700
Std. Dev.	0.180040	0.213784	117.4538	2.685400	853.5037	0.114433	0.008799	0.092421	0.137348
Skewness	-1.247788	-0.398087	1.439847	-1.172344	4.992784	1.234455	1.839661	-0.627626	-2.093556
Kurtosis	3.429852	2.732954	4.105696	3.165976	27.35589	3.790644	6.811014	3.104040	10.68741
Jarque-Bera	12.02376	1.322262	17.84099	10.35959	1299.226	12.60119	52.61484	2.974649	143.6778
Probability	0.002449	0.516267	0.000134	0.005629	0.000000	0.001835	0.000000	0.225976	0.000000
Sum	36.84885	28.49000	4315.790	876.2998	8743.640	4.459100	0.729893	5.480100	6.222500
Sum Sq. Dev.	1.426229	2.010964	606997.3	317.3003	32052619	0.576173	0.003407	0.375835	0.830032
Observations	45	45	45	45	45	45	45	45	45

Table 4.4 presents the mean, median, maximum and minimum values, standard deviation, as well as measures of skewness and kurtosis for each of the Debt Ratio, Earnings per Share, Long Term Debt as a percentage of Total Debt, Return on Equity and the Times Interest

Earned Ratio. In addition to this Table 4.4 also presents descriptive statistics for Asset Tangibility, Firm Size, and Existence of Non-debt tax Shields and the Return on Assets.

Each of the statistics will be discussed in greater detail in the sections that follow.

4.2.1 Debt Ratio

Data for nine JSE listed South African IT firms based on the Debt Ratio for a period of five years ranging from 2010 to 2014 was collected. The individual findings per company year on year are presented in Table 4.5.

Table 4.5: Debt Ratio per company per year

	Company:									Mean	Median
Year:	Adapt IT	Cognition	DataCentrix	Datatec	EOH	Huge Group	Jasco	Mustek	Pinnacle		
2010	0.63	0.28	0.34	0.74	0.87	0.88	0.55	0.64	0.58	0.61	0.63
2011	0.57	0.24	0.35	0.74	0.85	0.98	0.62	0.59	0.65	0.62	0.62
2012	0.61	0.21	0.36	0.76	0.78	1.03	0.61	0.56	0.65	0.62	0.61
2013	0.61	0.22	0.47	0.79	0.74	1.01	0.76	0.63	0.67	0.66	0.67
2014	0.70	0.18	0.48	0.81	0.78	0.95	0.71	0.66	0.65	0.66	0.70

Source: compiled by author

The data for the period has an average debt ratio of 63.31 %, with an average median of 65% and average standard deviation of 21.38%. Both the mean and the median for the JSE listed IT firms are higher than that of the combined sample presented in section 4.1 with the standard deviation of the sample being slighter lower. Figure 4.1 presents the data as a frequency distribution.

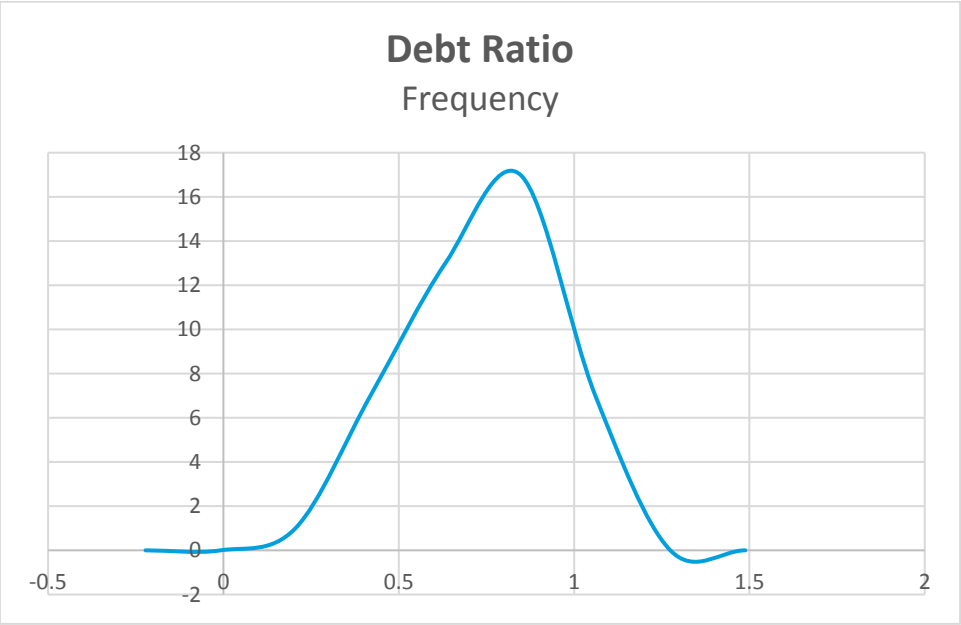

Figure 4.1: Debt Ratio Frequency Distribution

Source: compiled by author

The data is negatively skewed around the mean (with a skewness of -0.39807) and has a kurtosis of 2.732954 making the graphical presentation of the data slightly leptokurtic as can be seen in Figure 4.1. Figure 4.2 presents the trend of the year on year average ratios over the sample period.

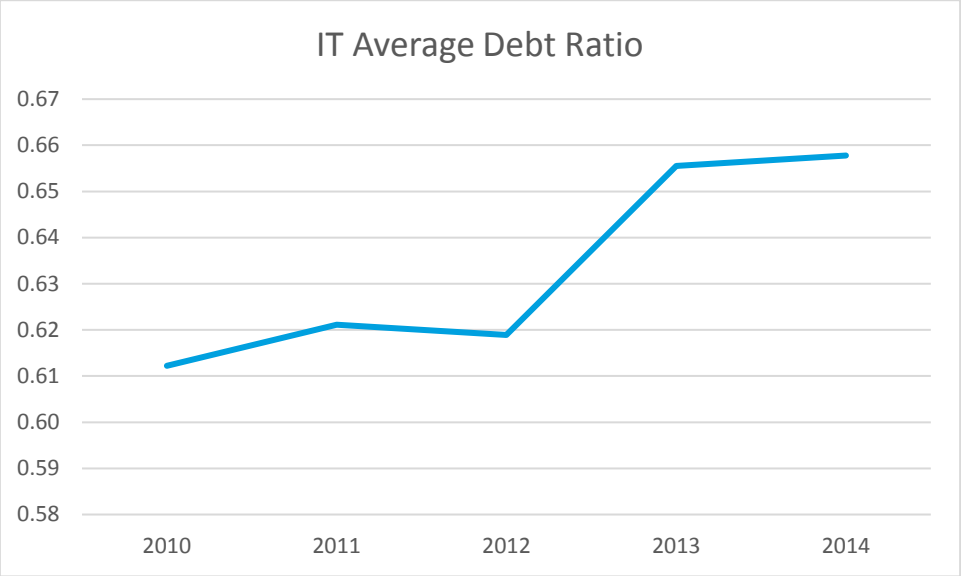

Figure 4.2: Year on year average debt ratio
Source: compiled by author

Taking the samples average yearly debt ratios and inserting them into a line graph the average trend of debt ratios within the sample shows a steady increase year on year (with the exception of 2012, which shows a decline from the previous year).

4.2.2 Earnings per Share

The findings per company are presented in Table 4.6.

Table 4.6: EPS per company per year.

	Company:									Mean	Median
Year:	Adapt IT	Cognition	DataCentrix	Datatec	EOH	Huge Group	Jasco	Mustek	Pinnacle		
2010	9.15	15.1	41	127.46	156.4	8.8	16.6	57.8	81.3	57.07	41.00
2011	11.5	14.5	46.3	165.50	196.1	-15.3	14	89.4	117.7	71.08	46.30
2012	17.5	16.5	46.9	345.47	253.1	-5.9	16.8	70.15	175.1	103.96	46.90
2013	22.3	18.3	39.6	372.97	339.1	-4.1	0.3	72.8	205.6	118.54	39.60
2014	34.6	20.2	45.6	331.57	446.6	13.7	0.5	100.72	166.5	128.89	45.60

Source: compiled by author

The EPS for the sample returned an average of R95.91, a median of R45.6 and a standard deviation of R117.45. Figure 4.4 presents the table contained in Table 4.6 as a frequency distribution.

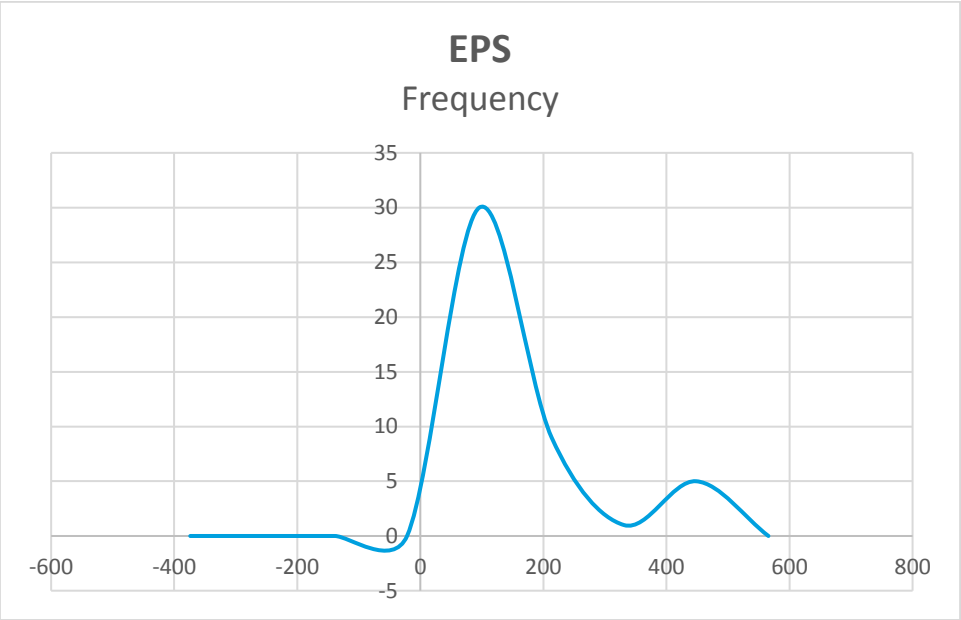

Figure 4.3: Earnings per Share Frequency Distribution
Source: compiled by author

The data has a skewness of 1.439847 and kurtosis of 4.105696. Figure 4.4 presents table 4.6 as a line graph.

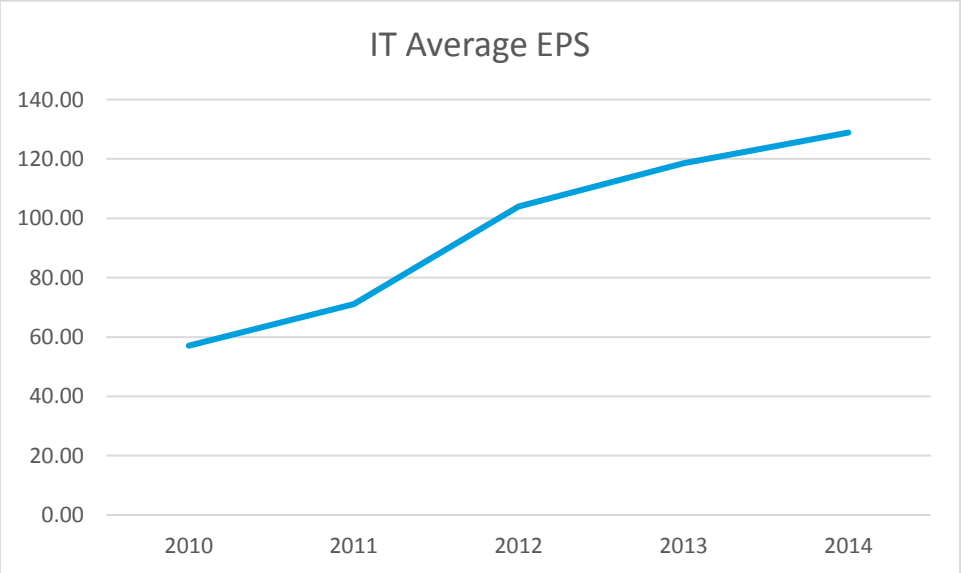

Figure 4.4: Average Year on Year Earnings per Share
Source: compiled by author

Figure 4.4 shows how the average year on year EPS trend is one of a steady increase over the time period, increasing from R57.07 in 2010 to R128.89 in 2014.

4.2.3 Long Term Debt as a Percentage of Total Debt

The year on year ratios are presented in Table 4.7.

Table 4.7: Long Term Loans as a percentage of Total Debt.

				Company:						Mean	Median
Year:	Adapt IT	Cognition	DataCentrix	Datatec	EOH	Huge Group	Jasco	Mustek	Pinnacle		
2010	3.41	28.01	0	1.57	4.91	2.45	46.49	12.29	1.22	11.15	3.41
2011	2.96	27.63	0	4.04	16.16	0.24	34.58	9.1	5.08	11.09	5.08
2012	0.88	22.4	5.79	1.09	20.63	0.27	5.79	0.41	3.16	6.71	3.16
2013	0	13.96	7.64	0.79	19.81	0.21	27.27	0.5	24.26	10.49	7.64
2014	3.84	12.04	6.31	0.99	26.69	0.38	15.24	1.99	23.43	10.10	6.31

The long term loans as a percentage of total debt ratio returned an average of 9.9% and a median of 4.91% with a standard deviation of 11.44%. The mean of the JSE listed South African IT firms is lower than that of the combined sample mean of 22.05% with the median of the JSE listed South African IT firms also being lower than the sample median of 13.64%. The JSE listed South African IT firms sample data is, however, less volatile than that of the combined sample with the aforementioned having a lower standard deviation in comparison to that of the combined sample. Figure 4.5 presents table 4.7 as a frequency distribution.

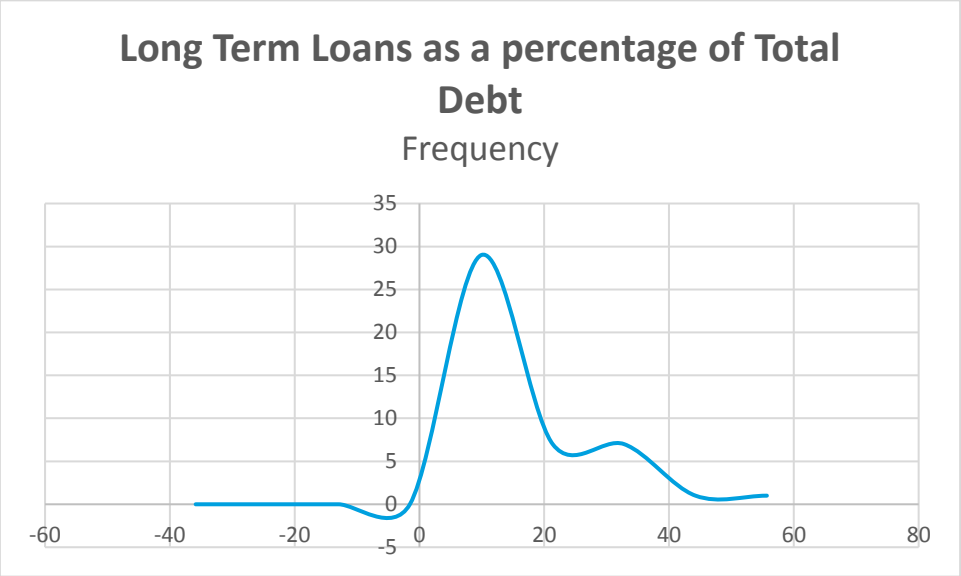

Figure 4.5: Long Term Loans as a percentage of Total debt Frequency Distribution
Source: compiled by author

The data is positively skewed around the mean with a skewness value of 1.234455 and is leptokurtic with a kurtosis of 3.790644. Figure 4.6 graphically presents table 4.6 as a line graph.

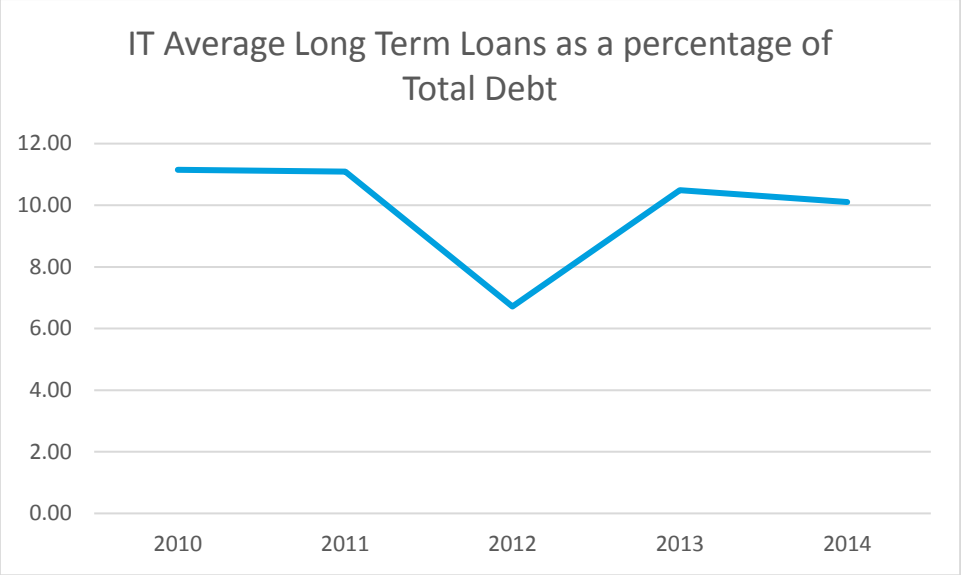

Figure 4.6: Long Term Loans as a percentage of Total debt year on year average
Source: compiled by author

The average long term loans as a percentage of total debt ratio shows a downward trend over the sample period with a rapid decline seen in 2012 with a correction again in 2013.

4.2.4 Return on Equity

The year on year average ratios are presented in Table 4.8.

Table 4.8: Return on Equity:

	Company:									Mean	Median
Year:	Adapt IT	Cognition	DataCentrix	Datatec	EOH	Huge Group	Jasco	Mustek	Pinnacle		
2010	23.02	24.32	20.99	3.79	23.38	3.51	7.59	9.43	25.97	15.78	20.99
2011	22.94	20.1	21.47	5.71	20.74	-6.36	2.95	13.64	35.01	15.13	20.10
2012	25.86	20.04	19.29	9.37	19.72	-2.04	6.45	10.61	34.75	16.01	19.29
2013	26.12	19.7	15.73	8.02	20.46	-4.64	-48.77	10.29	30	8.55	15.73
2014	20.6	19.95	16.53	6.29	18.62	5.39	1.85	11.72	22.14	13.68	16.53

The Return on Equity (ROE) ratio yielded an average of 13.82%, a median of 18.62% and a standard deviation of 13.73%. The Return on Equity mean for the JSE listed South African IT firms is higher than that of the combined sample mean, with a higher median and lower standard deviation in comparison. Figure 4.7 presents the data in table 4.8 as a frequency distribution below.

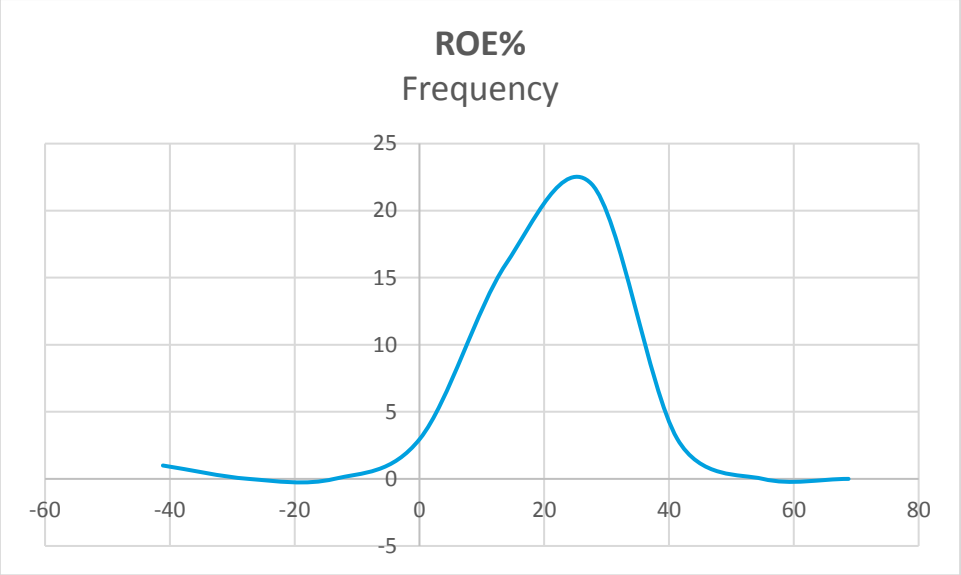

Figure 4.7: Return on Equity Frequency Distribution
Source: compiled by author

When presented graphically as a frequency distribution it can be seen from Figure 4.7 that the data is negatively skewed around the mean with a skewness value of -2.093556 and has a kurtosis of 10.68741. Figure 4.8 presents the year on year averages as a line graph below.

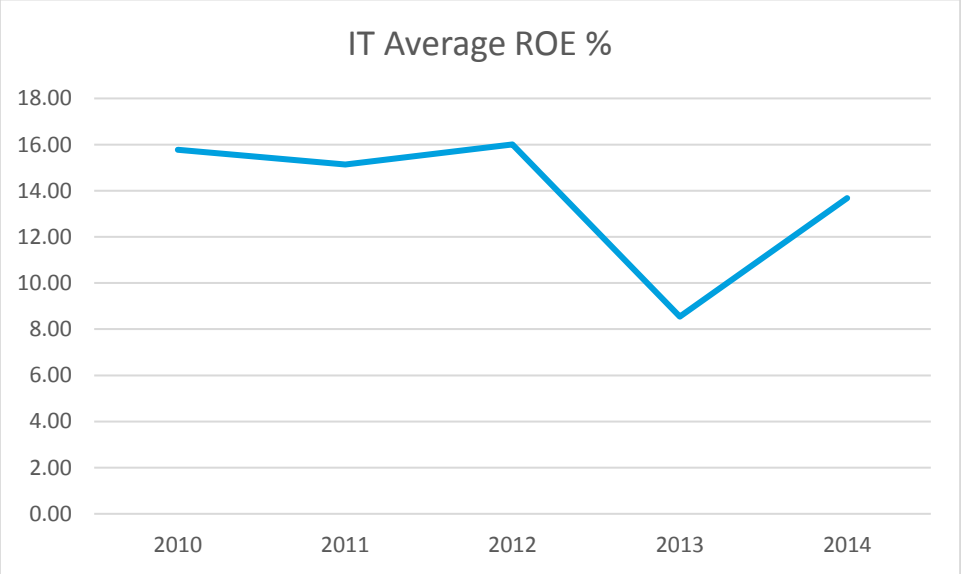

Figure 4.8: Return on Equity Average Year on Year trend.
Source: compiled by author

The overall trend for return on equity has been negative for the sample period.

4.2.5 Times Interest Earned Ratio

Table 4.9 presents the yearly figures per firm. Figure 11 presents table 14 as a frequency distribution, while figure 12 presents the samples yearly averages as a trend line in the form of a line graph.

Table 4.9: Times Interest Earned

				Company:						Mean	Median
Year:	Adapt IT	Cognition	DataCentrix	Datatec	EOH	Huge Group	Jasco	Mustek	Pinnacle		
2010	20.03	19.86	5 103.48	4.75	48.94	1.45	1.79	2.36	178.22	597.88	19.86
2011	13.67	26.79	2 765.29	5.44	30.46	-6.26	1.6	5.37	27.3	318.85	13.67
2012	31.41	37.43	57.59	6.93	12.93	-2.25	1.52	5.18	9.32	17.78	9.32
2013	37.45	57.21	27.42	5.49	10.44	-1.97	-3.84	3.91	6.13	15.80	6.13
2014	54.78	75.8	30.3	4.88	8.95	7.48	0.79	3.58	4.24	21.20	7.48

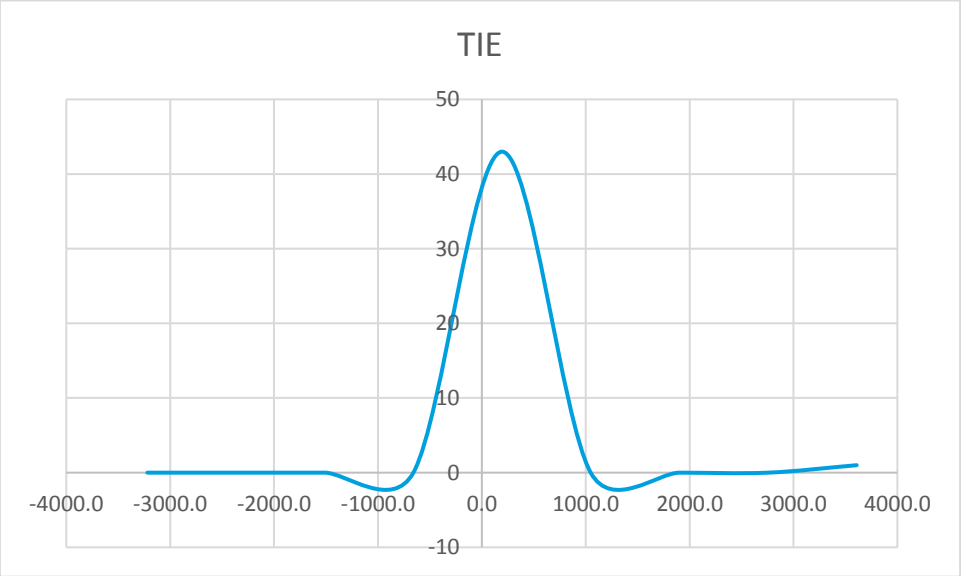

Figure 4.9: Times Interest Earned Frequency Distribution.
Source: compiled by author

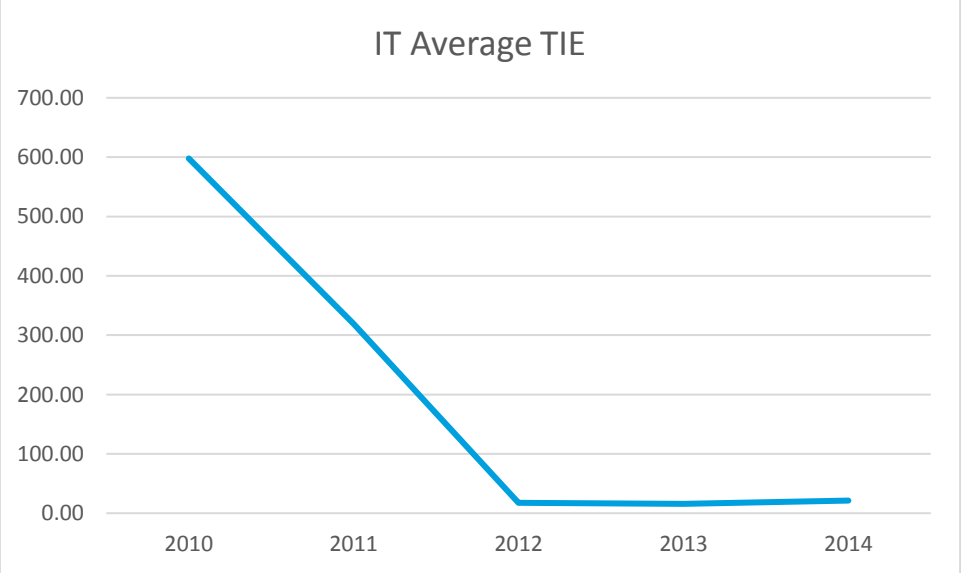

Figure 4.10: Times Interest Earned Average Year on Year trend.
Source: compiled by author

The Times Interest Earned (TIE) ratio for JSE listed South African IT firms returned an average of 194.3031 times, this result was largely skewed due to 1 firm having a large TIE ratio for 2010 and 2011 after 2011 the firm's TIE ratio dropped to a size more aligned with the rest of the sample. The sample returned a median of 8.95 times and a standard deviation of 853.5037 with a skewness of 4.992784 and kurtosis of 27.35589. Both the mean and the median for JSE listed South African IT firms are larger than that of the combined sample mean and median with the JSE listed South African IT firms having a higher standard deviation. The higher standard deviation can be attributed to the large times interest earned ratio of 1 firm for both 2010 and 2011 years.

4.2.6 Return on Assets

The return on assets for JSE listed South African IT firms was included as an independent variable in the regression analysis presented in section 4.5 below as a measure of a firm's profitability, the year on year returns are detailed in Table 4.10.

Table 4.10: Return on Assets

	Company:									Mean	Median
Year:	Adapt IT	Cognition	DataCentrix	Datatec	EOH	Huge Group	Jasco	Mustek	Pinnacle		
2010	16.57	23.2	18.7	4.27	19.64	5.98	6.5	7.43	15.61	13.10	15.61
2011	16.05	20.17	19.31	5.47	21.41	-9.94	4.5	9.6	18.84	11.71	16.05
2012	18.52	21.34	16.81	7.45	20.75	-3.49	4.56	6.38	18.67	12.33	16.81
2013	21.79	20.78	12.82	6.09	20.44	-5.07	-11.94	6.86	15.92	9.74	12.82
2014	31.38	21.15	14.11	4.93	19.53	13.49	2.77	6.84	11.82	14.00	13.49

The results show an average return on assets of 0.121780, a median of 0.141100, a standard deviation of 0.092421 for the sample of JSE listed IT firms. The data for the sample has a skewness of -0.627626 and kurtosis of 3.104040.

4.2.7 Asset Tangibility

Asset tangibility numbers were also collected as an additional independent variable to the regression analysis to account for the ratio of tangible assets to total assets in an effort to explain a firms asset makeup, the results are presented in Table 4.11.

Table 4.11: Asset Tangibility

	Company:									Mean	Median
Year:	Adapt IT	Cognition	DataCentrix	Datatec	EOH	Huge Group	Jasco	Mustek	Pinnacle		
2010	0.92	0.96	0.97	0.80	0.69	0.45	0.87	0.96	0.97	0.84	0.92
2011	0.89	0.95	0.97	0.80	0.66	0.45	0.85	0.96	0.96	0.83	0.89
2012	0.82	0.95	0.97	0.81	0.68	0.41	0.84	0.97	0.97	0.82	0.84
2013	0.76	0.94	0.93	0.80	0.70	0.40	0.89	0.97	0.96	0.82	0.89
2014	0.53	0.94	0.89	0.82	0.65	0.37	0.85	0.98	0.96	0.78	0.85

The period of 2010 – 2014 for the sample of JSE listed South African IT firms returned a mean of 0.818863, a median of 0.887705, and a standard deviation of 0.180040. The data is negatively skewed with a skewness of -1.247788 and kurtosis of 3.429852.

4.2.8 Firm Size

Firm size was calculated as the natural log of the firm's total assets for the purpose of providing a size metric in relation to the rest of the firms being measured which are listed on the same exchange, the data is presented in Table 4.12.

Table 4.12: Firm Size

	Company:									Mean	Median
Year:	Adapt IT	Cognition	DataCentrix	Datatec	EOH	Huge Group	Jasco	Mustek	Pinnacle		
2010	19	16	13	21	21	20	20	21	21	19.19	20.16
2011	18	16	13	21	21	20	20	21	21	19.30	20.44
2012	19	16	14	22	22	20	21	21	22	19.48	20.52
2013	19	17	14	22	22	20	21	22	22	19.63	20.59
2014	20	17	14	22	22	20	20	22	22	19.77	20.43

JSE listed South African IT firms have a mean firm size of 19.47333, a median of 20.44157, a standard deviation of 2.685400; a skewness of -1.172344, and kurtosis of 3.165976.

4.2.9 Existence of non-debt tax shields

The existence of non-debt tax shields was included in the regression analysis in order to test for the presence of non-debt deductions that shield the firm's net income from tax, the results are presented in Table 4.13.

Table 4.13: Existence of non-debt tax shields

	Company:									Mean	Median
Year:	Adapt IT	Cognition	DataCentrix	Datatec	EOH	Huge Group	Jasco	Mustek	Pinnacle		
2010	0.02	0.02	0.03	0.01	0.01	0.05	0.01	0.01	0.01	0.02	0.01
2011	0.03	0.02	0.04	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.02
2012	0.02	0.03	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.01
2013	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
2014	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01

The JSE Listed South African IT firms have an average non-debt tax shield of 0.16220, a median of 0.01, and a standard deviation of 0.008799.

4.2.10 Conclusion

There has been a steady increase in the debt ratios of JSE listed South African firms from 2010 to 2014 (with the exception of 2012) as can be seen in Figure 4.2 above. This has corresponded with a steady increase in EPS year on year as is represented by figure 4.4. In comparison, the Long term debt as a percentage of total debt shows a downward trend over the sample period. The Return on Equity ratio also showed a downward trend over the sample period.

4.3 JSE Top40

The data for the JSE Top40, including the mean; median; range; standard deviation; skewness and kurtosis, are presented in Table 4.14 below.

Table 4.14: JSE Top40

	ASSET	DEBT	EPS	FS	ICR	LTL	NOND	ROA	ROE
Mean	0.893446	0.422667	1099.641	24.45930	14.63115	0.390192	0.040581	0.250550	0.143801
Median	0.949670	0.360000	760.6000	24.58250	5.510000	0.384800	0.038555	0.116800	0.148200
Maximum	1.000000	1.140000	6016.000	26.35900	233.2400	0.920700	0.121844	15.19000	1.251700
Minimum	0.451667	0.040000	-562.0000	22.19688	-37.26000	0.000000	0.000000	-7.850000	-4.836500
Std. Dev.	0.143609	0.263626	1257.239	0.955714	32.22405	0.229312	0.027676	1.632862	0.521729
Skewness	-1.735008	0.685105	1.843091	-0.468031	4.680778	0.116086	0.693602	5.679720	-6.342381
Kurtosis	5.026803	2.497437	6.465142	2.820536	29.25972	2.210940	2.953002	61.41833	63.26759
Jarque-Bera	90.83782	11.98151	143.9727	5.109855	4371.817	3.805421	10.83680	19922.28	21336.10
Probability	0.000000	0.002502	0.000000	0.077698	0.000000	0.149164	0.004434	0.000000	0.000000
Sum	120.6152	57.06000	148451.5	3302.005	1975.205	52.67595	5.478409	33.82423	19.41320
Sum Sq. Dev.	2.763571	9.312840	2.12E+08	122.3940	139144.2	7.046234	0.102640	357.2759	36.47493

The data consists of 135 observations taken over the period from 2010 – 2014. The data for each of the ratios will be discussed in greater detail in the sections that follow.

4.3.1 JSE Top40 Average Debt Ratio

The year on year average debt ratios of the JSE listed Top40 over the period of 2010 – 2014, are represented in Table 4.15.

Table 4.15: JSE Top40 Debt Ratios

			Company:			
Year:	**ARM**	**Anglo American**	**Anglo Platinum**	**AngloGold Ashanti**	**ArcelorMittal**	**Aspen Pharmacare**
2010	0.22	0.32	0.19	0.40	0.17	0.75
2011	0.19	0.29	0.18	0.33	0.18	0.94
2012	0.18	0.32	0.27	0.38	0.17	0.94
2013	0.20	0.36	0.30	0.51	0.27	1.06
2014	0.16	0.38	0.30	0.50	0.28	1.14
Year:	**BHP Biliton**	**Compagnie Financiere Richemont**	**Exxaro Resources**	**Gold Fields**	**GrouthPoint Property**	**Harmony Gold**
2010	0.30	0.26	0.27	0.22	0.98	0.07
2011	0.32	0.26	0.18	0.29	0.96	0.09
2012	0.38	0.27	0.19	0.38	0.95	0.10
2013	0.38	0.29	0.16	0.37	0.96	0.12
2014	0.33	0.24	0.14	0.38	0.34	0.12
Year:	**Impala Platinum**	**Kumba Iron Ore**	**Lomnin**	**MTN Group**	**Naspers**	**Pick N Pay Group**
2010	0.12	0.24	0.24	0.57	0.57	0.83
2011	0.12	0.23	0.18	0.54	0.52	0.77
2012	0.13	0.23	0.27	0.52	0.49	0.78
2013	0.17	0.17	0.08	0.49	0.58	0.80
2014	0.17	0.27	0.11	0.49	0.60	0.79
Year:	**PPC**	**Remgro**	**SABMiller**	**Sasol**	**Shoprite**	**Steinhoff**
2010	0.71	0.06	0.65	0.19	0.63	0.69
2011	0.68	0.04	0.58	0.19	0.62	0.77
2012	0.66	0.05	0.97	0.18	0.57	0.82
2013	0.62	0.15	0.92	0.20	0.53	0.81
2014	0.73	0.12	0.84	0.20	0.56	0.74
Year:	**Telkom SA**	**Tiger Brands**	**Vodacom Group**	**Mean**	**Median**	**Std Dev**
2010	0.39	0.36	0.72	0.41	0.32	0.26
2011	0.34	0.43	0.66	0.40	0.32	0.26
2012	0.32	0.39	0.64	0.43	0.38	0.28
2013	0.44	0.49	0.65	0.45	0.38	0.28
2014	0.38	0.49	0.63	0.42	0.38	0.26

The debt ratio data for the Top40 has a mean of 42.26%; a median of 36%; a standard deviation of 26.36%; skewness of 0.685105 and a kurtosis of 2.497437. The JSE Top40 data mean is equivalent to that of the combined sample mean with the median of the JSE Top40 being slightly lower than the combined sample. The standard deviation of the JSE Top40 is higher than that of the combined sample. The data can be graphically presented as a frequency distribution as per Figure 13. Presenting the data in a line graph shows an upward trend over the period with a trough shown in 2011 and a peak in 2014 as per Figure 4.12.

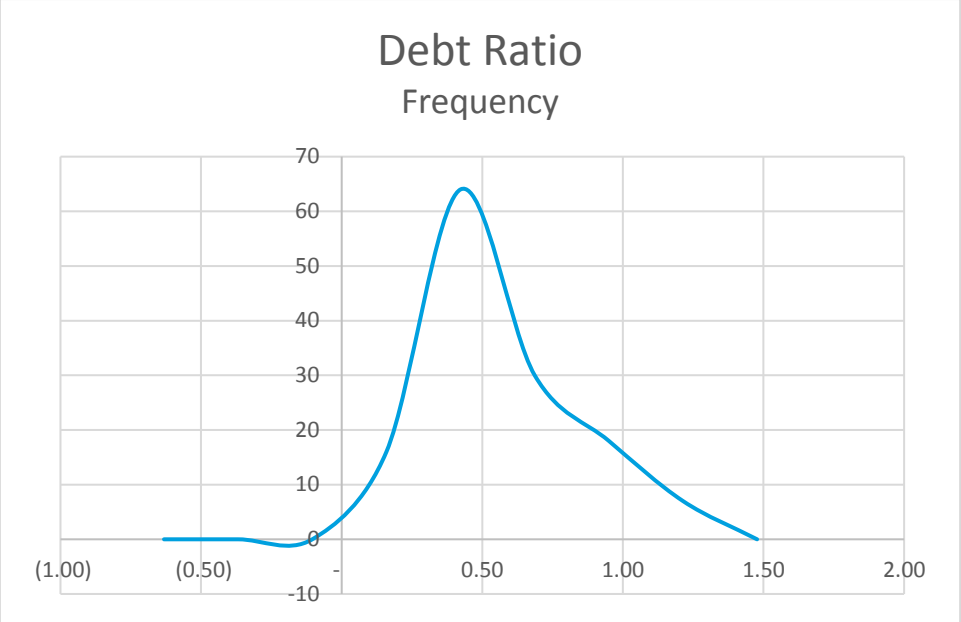

Figure 4.11: JSE Top40 Debt Ratio Frequency Distribution
Source: compiled by author

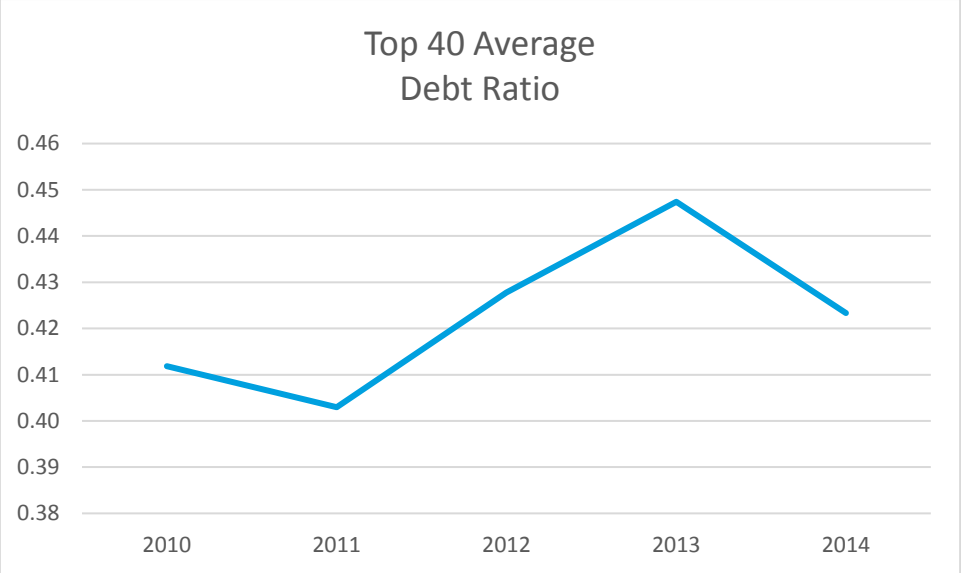

Figure 4.12: JSE Top40 Debt Ratio
Source: compiled by author

4.3.2 JSE Top40 Earnings per Share

The data for the JSE Top40 year on year information is presented in Table 4.16.

Table 4.16: JSE Top40 Earnings per Share for the period 2010 – 2014

			Company:			
Year:	**ARM**	**Anglo American**	**Anglo Platinum**	**AngloGold Ashanti**	**ArcelorMittal**	**Aspen Pharmacare**
2010	807	3123.77	1935	259.00	343	482.9
2011	1559	3587.93	1365	2773.00	-13	520.3
2012	1615	780.22	-562	2430.99	-129	650.1
2013	1735.00	984.19	556.00	192.98	-56	788
2014	1900	1301.73	301.00	-206.11	-57	1016.3
Year:	**BHP Biliton**	**Compagnie Financiere Richemont**	**Exxaro Resources**	**Gold Fields**	**GrouthPoint Property**	**Harmony Gold**
2010	1672.35	116.48	1495	292	-42.7	-7.00
2011	3148.43	186.38	2098	970	104.6	223.00
2012	2378.43	311.83	1401	816	72.7	565.00
2013	1972.25	471.42	1463	-45	138.7	47.00
2014	2820.42	571.23	1372	43.39	154.2	26.00
Year:	**Impala Platinum**	**Kumba Iron Ore**	**Lomnin**	**MTN Group**	**Naspers**	**Pick N Pay Group**
2010	786	4467	462.88	760.6	884.00	213.90
2011	1105	5313	945.49	1068.6	1125.00	164.90
2012	685	5313	59.67	1089.1	1297.00	142.70
2013	330	4808	297.95	1386	1722.00	111.30
2014	86	3432	-346.88	1536	1514.00	138.51
Year:	**PPC**	**Remgro**	**SABMiller**	**Sasol**	**Shoprite**	**Steinhoff**
2010	216.90	690.1	950.39	2657.00	455.4	254.6
2011	164.80	865.92	1049.92	3385.00	507.6	258.9
2012	162.00	994.6	1449.8	4228.00	607	317
2013	179.00	854.3	1898.18	5262.00	675.4	394.8
2014	179.00	1292.4	2237.79	6016.00	697.6	443.5
Year:	**Telkom SA**	**Tiger Brands**	**Vodacom Group**	**Mean**	**Median**	**Std Dev**
2010	67.8	1393	509.9	935	510	1061
2011	332.4	1575	655.5	1298	970	1308
2012	310.8	1689	708.9	1088	709	1288
2013	87	1623.9	872.4	1065	675	1314
2014	851.4	1815.7	895.8	1112	851	1362

The data for the period returned an average of R1099.64 and a median of R760.60 for the period of 2010 – 2014. Presenting the data contained in Table 4.16 as a frequency distribution is depicted in Figure 4.13.

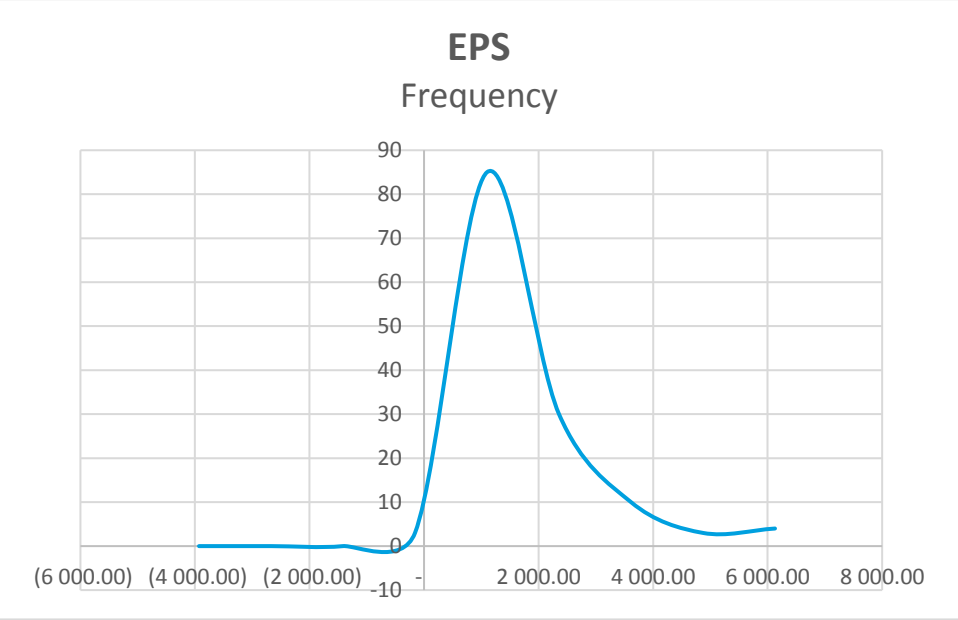

Figure 4.13: JSE Top40 Earnings per Share
Source: compiled by author

The data has a standard deviation of 1257.239, skewness of 1.843091, and kurtosis of 6.465142. The trend in average EPS for the sample over the period is presented in Figure 4.14.

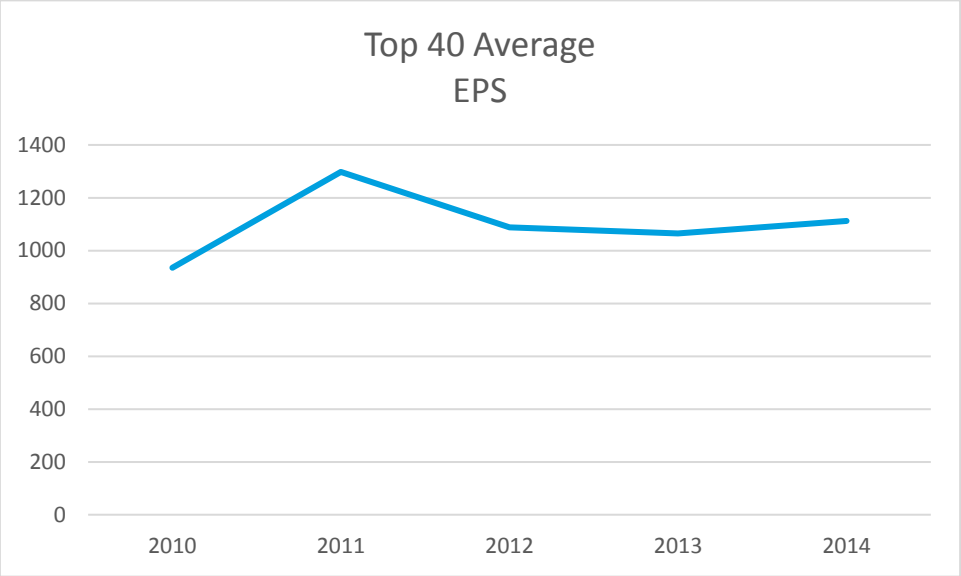

Figure 4.14: JSE Top40 Earnings per Share
Source: compiled by author

The data shows an increase from 2010 to 2011 followed by a decrease from 2011 to 2012 after which the EPS remains static for the remainder of the sample period.

4.3.3 JSE Top40 Long term debt as a percentage of total debt

The Long Term debt as a percentage of total debt ratio year on year percentages are given in Table 4.17.

Table 4.17: JSE Top40 Long Term Loans as a percentage of Total Debt

			Company:			
Year:	**ARM**	**Anglo American**	**Anglo Platinum**	**AngloGold Ashanti**	**ArcelorMittal**	**Aspen Pharmacare**
2010	41.36	61.63	42.91	73.81	13.92	27.94
2011	38.48	59.18	6.26	73.12	11.59	34.19
2012	35.5	63.25	34.81	58.22	13.23	46.07
2013	42.50	65.34	35.75	75.50	8.72	40.95
2014	41.8	71.55	35.24	78.05	2.81	65.09
Year:	**BHP Biliton**	**Compagnie Financiere Richemont**	**Exxaro Resources**	**Gold Fields**	**GrouthPoint Property**	**Harmony Gold**
2010	51.00	16.88	47.97	51.3	87.2	35.75
2011	38.57	6.15	33.35	47.84	86.86	36.98
2012	52.95	6.78	35.57	45.39	91.67	38.15
2013	59.45	12.9	48.75	75.62	92.07	48.42
2014	62.67	14.08	46.05	71.23	77.82	60.75
Year:	**Impala Platinum**	**Kumba Iron Ore**	**Lomnin**	**MTN Group**	**Naspers**	**Pick N Pay Group**
2010	24.06	48.59	50.16	34.73	46.30	8.05
2011	20.68	0	44.71	29.86	53.11	7.66
2012	32.17	0.18575492	56.08	28.26	52.77	8.99
2013	52.96	29.18	0	37.41	58.99	7.98
2014	53.5	29.13	19.41	36.85	59.12	7.21
Year:	**PPC**	**Remgro**	**SABMiller**	**Sasol**	**Shoprite**	**Steinhoff**
2010	61.40	6.65	57.54	24.01	0.17	55.7
2011	62.39	6.61	54.77	19.42	0.19	51.87
2012	61.19	3.62	72.79	13.48	23.47	49.64
2013	65.37	59.12	65.35	28.22	22.21	53.15
2014	74.44	4.89	55.61	28.22	19.79	55.24
Year:	**Telkom SA**	**Tiger Brands**	**Vodacom Group**	**Mean**	**Median**	**Std Dev**
2010	39.14	10.33	38.75	39	41	21
2011	48.16	10.19	30.6	34	34	23
2012	37.89	4.31	32.91	37	36	23
2013	22.95	14.85	24.15	43	43	24
2014	27.21	6.27	27.93	42	42	24

The data returned an average of 39.02% for the period and a median of 38.48%. Figure 4.15 depicts the firm yearly numbers as a frequency distribution.

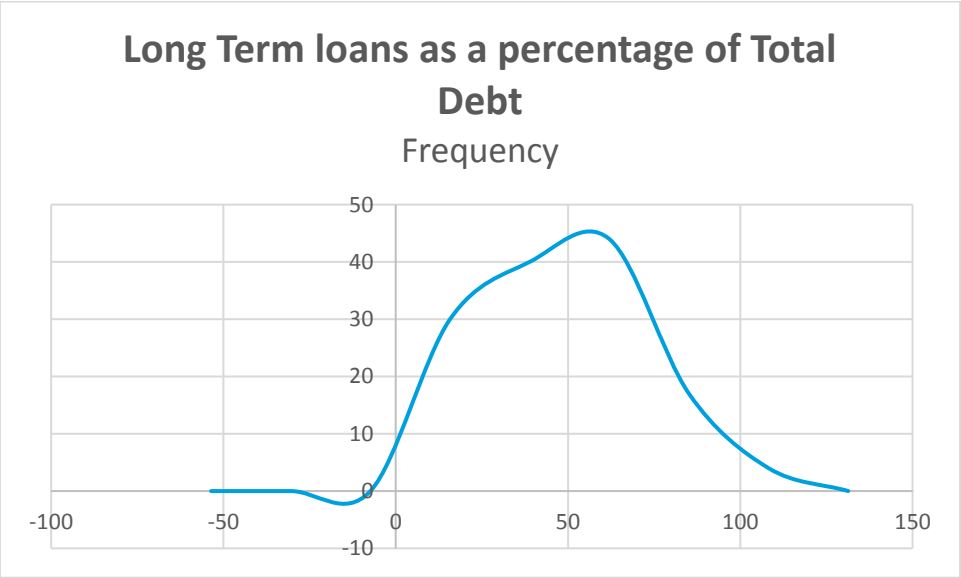

Figure 4.15: JSE Top40 Long Term Loans as a percentage of Total Debt
Source: compiled by author

The LTDTD ratios have a standard deviation of 22.93%; a skewness of 0.116086 and a kurtosis of 2.210940. The JSE Top40 mean and median is higher than that of the combined sample mean and median with a standard deviation that is 0.86% lower than that of the combined sample standard deviation. Figure 4.16 depicts the yearly averages of the data in a line graph.

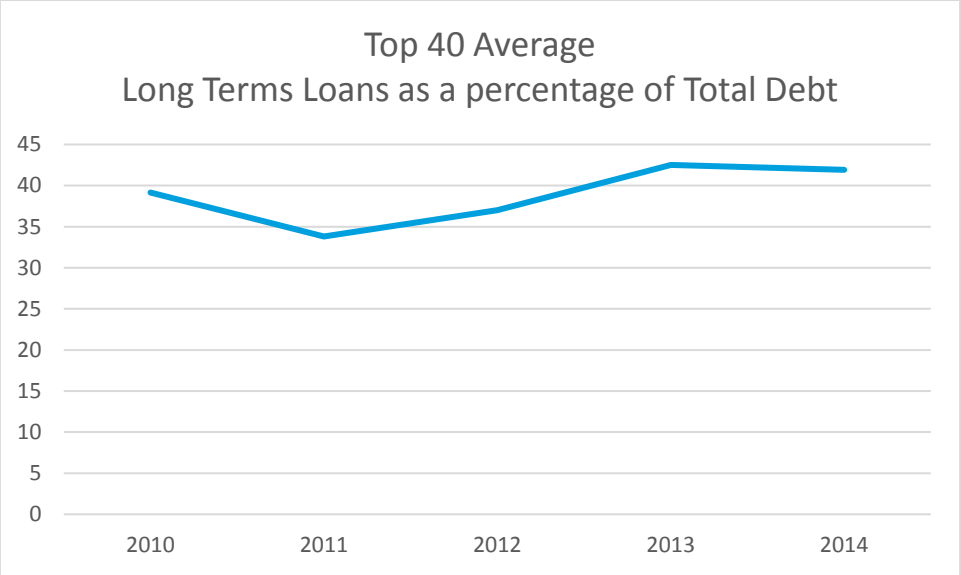

Figure 4.16: JSE Top40 Long Term Loans as a percentage of Total Debt
Source: compiled by author

The data shows a fairly static trend over the period which fluctuates within the range of the sample.

4.3.4 JSE Top40 Return on Equity

Table 4.18 presents the year on year ROE per company included in the sample.

Table 4.18: JSE Top40 Return on Equity

			Company:			
Year:	**ARM**	**Anglo American**	**Anglo Platinum**	**AngloGold Ashanti**	**ArcelorMittal**	**Aspen Pharmacare**
2010	10.2	21.23	18.25	2.43	5.96	18.65
2011	15.65	13.79	6.37	27.90	0.04	19.73
2012	14.82	-3.85	-13.4	14.80	-2.28	16.2
2013	6.79	-2.8	-2.75	-66.94	-10.38	15.44
2014	12.32	-8.97	1.23	-1.92	-0.76	17.34
Year:	**BHP Biliton**	**Compagnie Financiere Richemont**	**Exxaro Resources**	**Gold Fields**	**GrouthPoint Property**	**Harmony Gold**
2010	29.12	11.27	29.87	5.44	2.45	-0.66
2011	36.4	14.02	32.44	14.99	-22.73	2.05
2012	22.73	17.56	33.61	11.02	-103.14	7.76
2013	14.23	17.68	17.13	-8.7	-483.65	-7.33
2014	16.48	17.44	-2.57	0.34	11.18	-4.09
Year:	**Impala Platinum**	**Kumba Iron Ore**	**Lomnin**	**MTN Group**	**Naspers**	**Pick N Pay Group**
2010	10.77	99.9	4.42	19.90	9.68	55.44
2011	13.96	107.64	8.07	23.35	12.94	36.36
2012	8.33	107.64	-15.98	23.26	6.09	46.32
2013	1.96	74.15	4.5	22.97	11.25	22.79
2014	0.02	51.65	-5.45	24.96	8.69	21.60
Year:	**PPC**	**Remgro**	**SABMiller**	**Sasol**	**Shoprite**	**Steinhoff**
2010	117.72	7.07	10.25	16.83	38.38	14.76
2011	90.58	16.82	9.48	18.39	35.43	14.95
2012	65.31	17.37	16.32	18.83	23.75	12.26
2013	59.68	7.51	11.48	17.56	23.69	12.39
2014	46.28	10.47	12.04	17.30	21.66	11.99
Year:	**Telkom SA**	**Tiger Brands**	**Vodacom Group**	**Mean**	**Median**	**Std Dev**
2010	125.17	26.36	30.54	27.46	16.83	33.84529145
2011	4.12	26.21	52.78	23.40	15.65	26.27311489
2012	-0.73	24.05	54.81	16	16	35
2013	-65.11	19.95	62.46	-8	11	100
2014	16.78	15.33	57.44	14	12	17

The return on equity data for the JSE Top40 returned a mean of 14.38%; a median of 14.82%; standard deviation of 52.17%; skewness of -6.342381 and kurtosis of 63.26759. The Top40 mean; median and standard deviation is higher than that of the combined sample mean; median and standard deviation. The data in Table 4.18 is graphically presented as a frequency distribution in Figure 4.17 and a line graph in Figure 4.18 showing the samples yearly averages for the sample period.

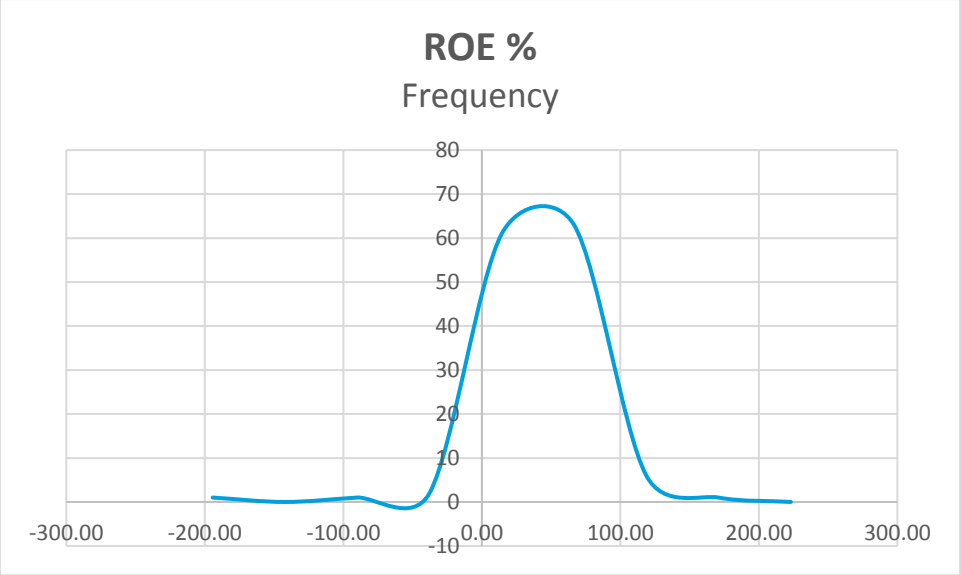

Figure 4.17: JSE Top40 Return on Equity Frequency Distribution
Source: compiled by author

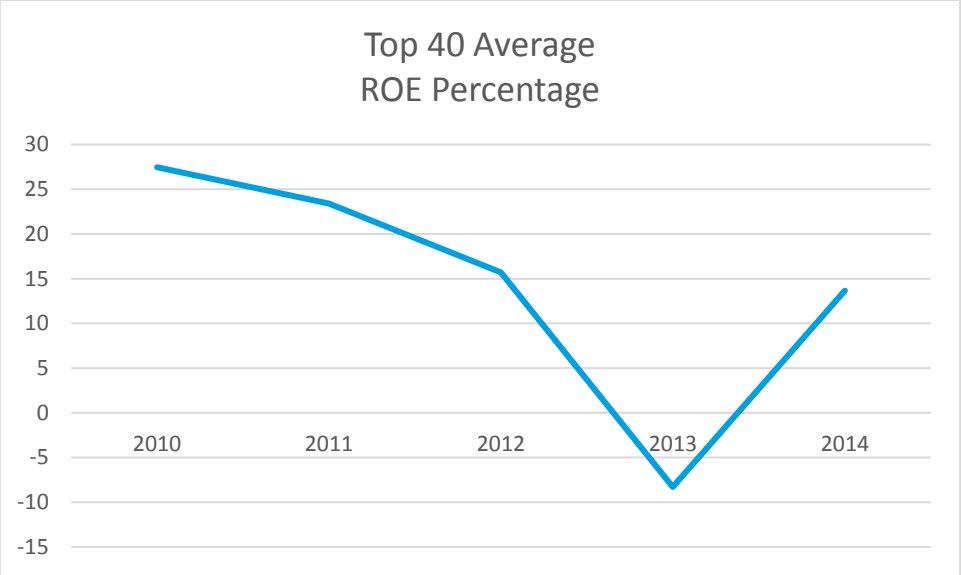

Figure 4.18: JSE Top40 Return on Equity Year on year average
Source: compiled by author

The yearly average (Figure 4.20) shows a steady decrease in ROE for the sample period with a recovery recorded in 2014.

4.3.5 Times Interest Earned Ratio

Table 4.19 presents the times interest earned ratio for the company for the sample period.

Table 4.19: JSE Top40 Times Interest Earned

	TIE:					
	Company:					
Year:	**ARM**	**Anglo American**	**Anglo Platinum**	**AngloGold Ashanti**	**ArcelorMittal**	**Aspen Pharmacare**
2010	15.71	13.15	57.88	2.88	4.24	4.76
2011	24.59	14.15	33.06	12.32	1.77	5.44
2012	22.18	-0.59	-15.5	5.97	-1.43	5.23
2013	12.88	2.86	2.36	-7.16	-5.17	5.91
2014	4.07	-0.26	1.60	1.78	-0.37	5.51
Year:	**BHP Biliton**	**Compagnie Financiere Richemont**	**Exxaro Resources**	**Gold Fields**	**GrouthPoint Property**	**Harmony Gold**
2010	29.70	5.17	4.47	12.72614292	1	0.72
2011	39.46	4.95	4.76	51.06075739	0.94	1.10
2012	24.85	6.64	5.35	15.95295936	0.77	7.41
2013	12.62	15.94	6.66	-8.558986659	0.75	-7.64
2014	17.43	14.62	-17.99	2.378024194	4.15	-4.99
Year:	**Impala Platinum**	**Kumba Iron Ore**	**Lomnin**	**MTN Group**	**Naspers**	**Pick N Pay Group**
2010	22.34	141.19	22.56	5.21	4.49	20.13
2011	17.94	214.54	7.14	5.94	3.81	12.86
2012	20.08	57.17	7.14	4.08	1.76	9.38
2013	5.78	71.68	-37.26	3.92	0.83	6.66
2014	-0.35	36.98	-2.37	5.19	0.15	6.26
Year:	**PPC**	**Remgro**	**SABMiller**	**Sasol**	**Shoprite**	**Steinhoff**
2010	5.33	11.07	3.24	11.32	34.72	2.75
2011	4.71	85.46	4.2	16.48	30.96	2.49
2012	4.65	233.24	4.59	18.11	20.05	3.15
2013	4.46	1.46	2.97	31.49	12.4	3.36
2014	3.23	0.7	4.02	36.81	12.44	4.05
Year:	**Telkom SA**	**Tiger Brands**	**Vodacom Group**	**Mean**	**Median**	**Std Dev**
2010	32.57	9.35	6.52	18	5	34
2011	4.29	40.33	15.5	24	16	26
2012	1.7	18.22	22.16	18	16	35
2013	-16.14	7.69	20.76	7	11	100
2014	15.76	5.83	19.31	6	12	17
				14.40	12	42

The times interest earned ratio for the JSE Top40 (excluding financial firms) returned an average of 14.63115 and a median of 5.51. The data in Table 4.19 is graphically presented as a frequency distribution as per Figure 4.19 below with a standard deviation of 32.2240.

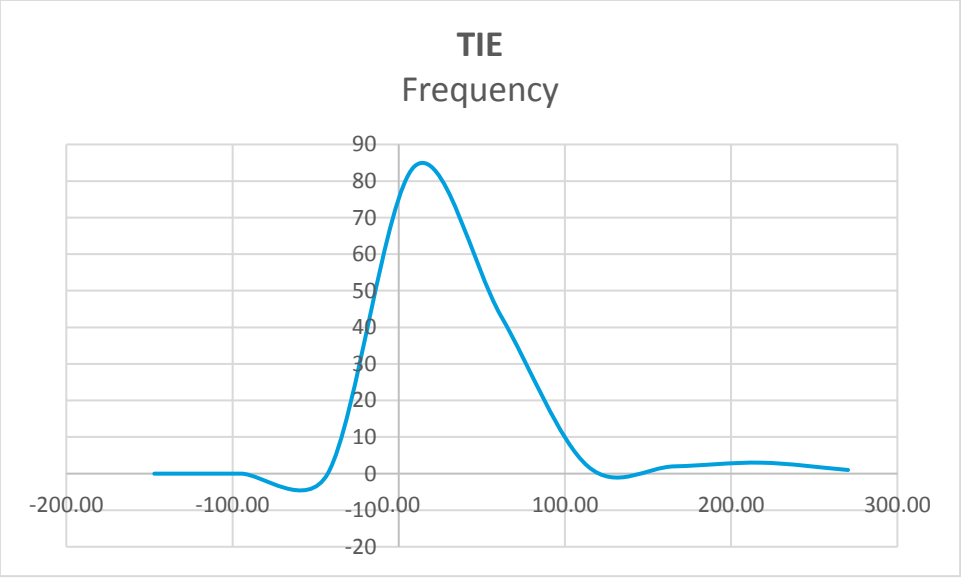

Figure 4.19: JSE Top40 Times Interest Earned Frequency Distribution
Source: compiled by author

The JSE Top40 mean; median and standard deviation are lower than that of the combined sample mean; median and standard deviation. The data are positively skewed around the mean with a skewness of 4.680778 and kurtosis of 29.25972. The average returns year on year show are graphically presented in Figure 4.20.

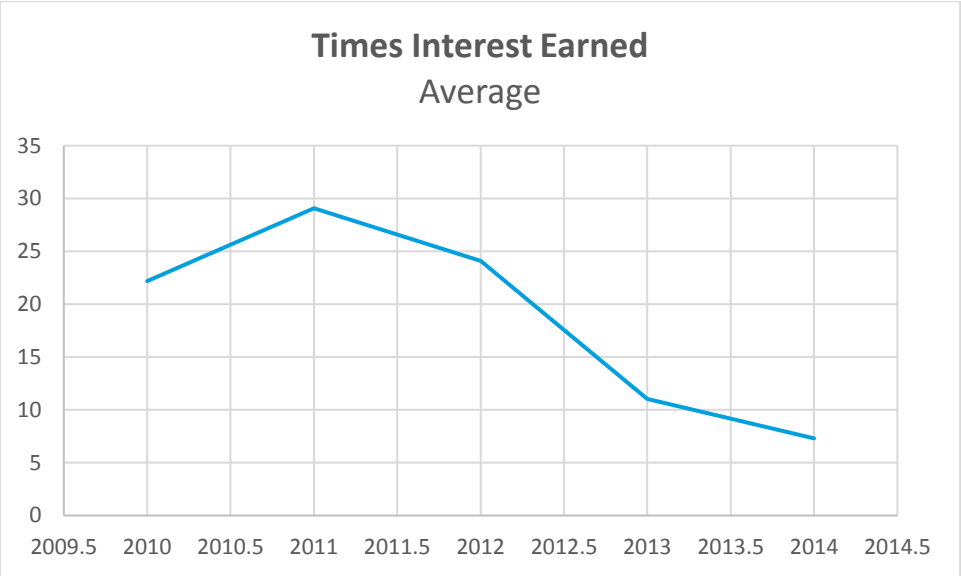

Figure 4.20: JSE Top40 Times Interest Earned Year on year average
Source: compiled by author

The data shows an increase from 2010 to 2011, however, start to decrease thereafter. This decreasing trend continues until the end of the sample period.

4.3.6 Return on Assets

The year on year return on assets for the JSE Top40 is presented in Table 4.20.

Table 4.20: JSE Top40 Return on Assets

			Company:			
Year:	**ARM**	**Anglo American**	**Anglo Platinum**	**AngloGold Ashanti**	**ArcelorMittal**	**Aspen Pharmacare**
2010	10.77	18.18	15.19	0.02	6.8	24.53
2011	16.54	12.25	8.18	0.13	0.92	23.76
2012	14.65	-0.61	-7.85	0.07	-1.55	27.17
2013	7.64	2.67	1.79	-0.23	-5.84	24.58
2014	2.91	-0.22	1.24	0.00	-0.67	18.47
Year:	**BHP Biliton**	**Compagnie Financiere Richemont**	**Exxaro Resources**	**Gold Fields**	**GrouthPoint Property**	**Harmony Gold**
2010	25.21	12.07	9.24	0.065498097	8.5	0.00
2011	27.25	14.52	7.63	0.092730358	6.57	0.01
2012	18.56	18.63	4.19	0.029238597	5.76	0.05
2013	13.36	16.68	5.05	-0.081608036	5.36	-0.06
2014	14.33	17.82	-6.95	0.002974758	8.84	-0.03
Year:	**Impala Platinum**	**Kumba Iron Ore**	**Lomnin**	**MTN Group**	**Naspers**	**Pick N Pay Group**
2010	11.58	90.16	5.81	25.81	11.06	18.31
2011	14.28	92.89	7.08	26.73	10.86	13.35
2012	8.55	63.37	-16.66	28.02	3.75	11.50
2013	3.24	63.73	3.26	26.22	1.61	7.24
2014	-0.22	37.71	-6.2	24.97	0.38	6.87
Year:	**PPC**	**Remgro**	**SABMiller**	**Sasol**	**Shoprite**	**Steinhoff**
2010	32.33	1.37	12.73	15.50	18.69	13.02
2011	26.94	4.3	11.68	17.02	19.49	8.25
2012	25.71	8.49	18.97	18.22	14.93	9.46
2013	21.07	0.38	14.5	16.44	16.4	10.52
2014	15.37	1.01	14.87	15.04	14.43	10.37
Year:	**Telkom SA**	**Tiger Brands**	**Vodacom Group**	**Mean**	**Median**	**Std Dev**
2010	81.49	25.71	29.82	19	13	21
2011	7.73	27.25	36.98	16	12	18
2012	2.65	25.14	38.44	13	9	16
2013	-27.28	15.51	38.29	10	7	16
2014	12.58	12.3	36.66	9	9	11
				13.63	10	17

The sample showed an average return on assets of 0.250550; a median of 0.1168, and a standard deviation of 1.632862.

4.3.7 Asset Tangibility

The data for Asset Tangibility for the JSE Top40 is presented in Table 4.21 below.

Table 4.21: JSE Top40 Asset Tangibility

			Company:			
Year:	**ARM**	**Anglo American**	**Anglo Platinum**	**AngloGold Ashanti**	**ArcelorMittal**	**Aspen Pharmacare**
2010	0.99	0.97	1	0.98	1.00	0.54
2011	0.99	0.97	1	0.98	1.00	0.49
2012	0.99	0.94	1	0.98	1.00	0.46
2013	1.00	0.94	1.00	0.97	1.00	0.45
2014	1.00	0.94	1.00	0.98	1.00	0.49
Year:	**BHP Biliton**	**Compagnie Financiere Richemont**	**Exxaro Resources**	**Gold Fields**	**GrouthPoint Property**	**Harmony Gold**
2010	0.99	0.95	1.00	0.937910695	0.96	0.94
2011	0.99	0.92	1.00	0.947095465	0.97	0.95
2012	0.96	0.93	0.98	0.953086729	0.97	0.95
2013	0.96	0.93	0.98	0.940895613	0.98	0.95
2014	0.96	0.94	1.00	0.943756653	0.98	0.98
Year:	**Impala Platinum**	**Kumba Iron Ore**	**Lomnin**	**MTN Group**	**Naspers**	**Pick N Pay Group**
2010	0.98	1.00	0.77	0.80	0.62	0.90
2011	0.98	1.00	0.77	0.81	0.70	0.96
2012	0.99	1.00	0.77	0.81	0.73	0.93
2013	1.00	1.00	0.89	0.83	0.74	0.93
2014	1.00	1.00	0.89	0.86	0.75	0.93
Year:	**PPC**	**Remgro**	**SABMiller**	**Sasol**	**Shoprite**	**Steinhoff**
2010	0.99	0.99	0.58	0.99	0.97	0.69
2011	0.99	0.99	0.58	0.99	0.97	0.64
2012	0.98	0.99	0.46	0.99	0.97	0.63
2013	0.96	0.92	0.48	0.99	0.97	0.63
2014	0.92	0.93	0.50	0.99	0.97	0.67
Year:	**Telkom SA**	**Tiger Brands**	**Vodacom Group**	**Mean**	**Median**	**Std Dev**
2010	0.92	0.85	0.84	1	1	0
2011	0.93	0.76	0.87	1	1	0
2012	0.93	0.78	0.89	1	1	0
2013	0.94	0.78	0.90	1	1	0
2014	0.93	0.82	0.91	1	1	0
				0.89	0.9517	0.146

The asset tangibility for the JSE Top40 returned an average of 0.893446; a standard deviation of 0.143609, and a median of 0.949670.

4.3.8 Firm Size

The data for firm size for the JSE Top40 (excluding financial firms) sample is presented in Table 4.22.

Table 4.22: JSE Top40 Firm Size

			Company:			
Year:	**ARM**	**Anglo American**	**Anglo Platinum**	**AngloGold Ashanti**	**ArcelorMittal**	**Aspen Pharmacare**
2010	24	25	25	25	24	24
2011	24	25	25	25	24	24
2012	24	25	25	23	24	24
2013	24	25	25	23	24	25
2014	24	25	25	23	24	25
Year:	**BHP Biliton**	**Compagnie Financiere Richemont**	**Exxaro Resources**	**Gold Fields**	**GrouthPoint Property**	**Harmony Gold**
2010	25	23	24	25	24	24
2011	25	23	24	25	25	24
2012	26	23	24	25	25	24
2013	26	23	25	25	25	24
2014	26	23	25	23	25	24
Year:	**Impala Platinum**	**Kumba Iron Ore**	**Lomnin**	**MTN Group**	**Naspers**	**Pick N Pay Group**
2010	25	24	22	26	25	23
2011	25	24	22	26	25	23
2012	25	24	22	26	25	23
2013	25	25	22	26	25	23
2014	25	25	22	26	26	23
Year:	**PPC**	**Remgro**	**SABMiller**	**Sasol**	**Shoprite**	**Steinhoff**
2010	23	25	24	26	24	25
2011	23	25	24	26	24	25
2012	23	25	25	26	24	26
2013	23	25	25	26	24	26
2014	23	25	25	26	24	26
Year:	**Telkom SA**	**Tiger Brands**	**Vodacom Group**	**Mean**	**Median**	**Std Dev**
2010	25	23	24	24	24	1
2011	25	24	24	24	24	1
2012	25	24	25	24	25	1
2013	24	24	25	25	25	1
2014	24	24	25	25	25	1

The firm size for the JSE Top40 was calculated as the natural log of the firm's assets as per the research methodology presented in Chapter Three. The data shows a mean of 24.45930 and a median of 24.58250. The data has a standard deviation of 0.955714.

4.3.9 Existence of non-debt tax shields

The data for the JSE Top40 (excluding financial firms) is presented in Table 4.23.

Table 4.23 JSE Top40 Existence of non-debt tax shields

			Company:			
Year:	**ARM**	**Anglo American**	**Anglo Platinum**	**AngloGold Ashanti**	**ArcelorMittal**	**Aspen Pharmacare**
2010	2%	3%	5%	8%	4%	1%
2011	2%	3%	5%	6%	4%	1%
2012	3%	3%	6%	6%	5%	1%
2013	3%	4%	5%	8%	5%	1%
2014	3%	4%	5%	8%	4%	1%
Year:	**BHP Biliton**	**Compagnie Financiere Richemont**	**Exxaro Resources**	**Gold Fields**	**GrouthPoint Property**	**Harmony Gold**
2010	5%	2%	5%	11%	0%	0.03
2011	5%	2%	3%	7%	0%	0.04
2012	5%	2%	2%	7%	0%	0.05
2013	5%	2%	2%	8%	0%	0.05
2014	6%	2%	2%	10%	0%	0.05
Year:	**Impala Platinum**	**Kumba Iron Ore**	**Lomnin**	**MTN Group**	**Naspers**	**Pick N Pay Group**
2010	0%	3%	2%	9%	2%	6%
2011	0%	3%	2%	7%	1%	6%
2012	1%	4%	2%	8%	2%	6%
2013	3%	5%	3%	7%	1%	6%
2014	3%	5%	3%	7%	2%	5%
Year:	**PPC**	**Remgro**	**SABMiller**	**Sasol**	**Shoprite**	**Steinhoff**
2010	6%	1%	2%	4%	5%	2%
2011	6%	1%	2%	4%	5%	1%
2012	6%	1%	2%	5%	4%	1%
2013	5%	1%	2%	5%	4%	1%
2014	5%	1%	2%	5%	4%	1%
Year:	**Telkom SA**	**Tiger Brands**	**Vodacom Group**	**Mean**	**Median**	**Std Dev**
2010	7%	2%	10%	4%	3%	3%
2011	7%	2%	10%	4%	3%	3%
2012	9%	2%	10%	4%	4%	3%
2013	12%	3%	9%	4%	4%	3%
2014	12%	3%	9%	4%	4%	3%
				4%	4%	3%

The existence of non-debt tax shields was calculated for the JSE Top40 in order to access the existence of non-debt shields that act to shield the firm's after-tax income. The data shows an average of 0.040581 over the 2010-2014 period, a standard deviation of 0.027676, and a median of 0.38555.

4.3.10 Comparison

The debt ratios of the JSE Top40 showed an increase over the period of 2010 to 2014 (with declines in the years 2011 and 2014) as can be seen in Figure 4.12. This has corresponded with an increase in EPS year on year as is represented by Figure 4.14. The Long term debt as a percentage of total debt shows an upward trend over the sample period. The Return on Equity ratio showed a downward trend over the sample period.

4.4 NASDAQ listed IT Firms

The data for the NASDAQ listed US IT firms are presented in Table 4.24.

Table 4.24: NASDAQ listed US IT firms

	ASSET	DEBT	EPS	FS	ICR	LTL	NOND	ROA	ROE
Mean	0.381877	0.360846	0.913154	20.07230	26.54013	0.086361	0.051394	0.024207	0.037679
Median	0.079839	0.358793	0.601500	19.61435	6.465500	0.000000	0.032233	0.053935	0.084337
Maximum	1.539646	0.747276	9.184000	23.27516	864.8947	0.605762	1.539646	0.842210	0.882912
Minimum	-0.100640	0.046102	-4.463000	17.12569	-1088.918	0.000000	-0.100640	-1.996547	-2.460777
Std. Dev.	0.426012	0.151683	1.798926	1.548945	164.8158	0.152007	0.139694	0.232926	0.327709
Skewness	0.668844	0.281952	1.239007	0.382438	-0.148910	1.739149	9.460118	-5.335521	-4.401933
Kurtosis	1.793511	2.591271	7.275249	2.239679	26.97126	4.957589	100.7327	47.61944	31.66616
Jarque-Bera	17.57720	2.627337	132.2658	6.300250	3113.014	86.29137	53677.35	11400.81	4870.973
Probability	0.000152	0.268832	0.000000	0.042847	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	49.64407	46.90992	118.7100	2609.399	3450.216	11.22687	6.681235	3.146934	4.898300
Sum Sq. Dev.	23.41170	2.967981	417.4615	309.5008	3504186.	2.980685	2.517376	6.998851	13.85370
Observations	130	130	130	130	130	130	130	130	130

The individual ratios will be discussed in greater detail in the sections to follow. The data consists of 130 observations obtained over a period of 5 years starting in 2010 through to 2014.

4.4.1 Debt Ratio

The year on year information is presented in Table 4.25.

Table 4.25: NASDAQ listed IT firms Debt Ratios

	Company:					
Year	ADOBE SYSTEMS INC	ALLOT COMMUNICATIONS LTD.	ANSYS INC	APPLE INC.	ASTRO MED INC	AWARE INC
2010	0.36	0.32	0.28	0.36	0.16	0.07
2011	0.36	0.18	0.28	0.34	0.17	0.06
2012	0.34	0.24	0.26	0.33	0.20	0.05
2013	0.35	0.15	0.22	0.40	0.15	0.05
2014	0.37	0.18	0.19	0.52	0.15	0.06
Year	BOTTOMLINE TECHNOLOGIES INC	BROADVISION INC	CHINA DIGITAL TV HOLDING CO., LTD.	COMMVAULT SYSTEMS, INC	INGRAM MICRO INC	INTERACTIVE INTELLIGENCE GROUP, INC.
2010	0.22	0.20	0.35	0.45	0.64	0.44
2011	0.21	0.18	0.36	0.47	0.64	0.44
2012	0.20	0.18	0.57	0.41	0.69	0.49
2013	0.39	0.16	0.25	0.39	0.67	0.46
2014	0.45	0.15	0.27	0.43	0.68	0.50
Year	INTUIT INC	LEXMARK INTERNATIONAL INC	LIVEPERSON INC	LOGMEIN, INC.	MANHATTAN ASSOCIATES INC	MICROSTRATEGY INC
2010	0.46	0.62	0.20	0.30	0.34	0.61
2011	0.49	0.62	0.17	0.33	0.38	0.63
2012	0.41	0.64	0.18	0.34	0.38	0.58
2013	0.36	0.62	0.22	0.40	0.39	0.47
2014	0.41	0.65	0.25	0.45	0.43	0.42
Year	NATIONAL INSTRUMENTS CORP	PROGRESS SOFTWARE CORP	RACKSPACE HOSTING, INC.	RADISYS CORP	ROSETTA STONE INC	SAPIENS INTERNATIONAL CORPORATION N.V.
2010	0.22	0.27	0.42	0.43	0.36	0.38
2011	0.26	0.28	0.42	0.44	0.38	0.29
2012	0.27	0.28	0.35	0.46	0.47	0.28
2013	0.24	0.25	0.29	0.54	0.55	0.23
2014	0.23	0.23	0.34	0.52	0.78	0.23
Year	SMITH MICRO SOFTWARE INC	SYNOPSYS INC	TAKE TWO INTERACTIVE SOFTWARE INC	Mean	Median	Std Dev
2010	0.07	0.36	0.37	0.34	0.36	0.15
2011	0.19	0.38	0.48	0.35	0.36	0.15
2012	0.22	0.40	0.54	0.36	0.34	0.16
2013	0.42	0.36	0.55	0.35	0.36	0.16
2014	0.46	0.36	0.75	0.39	0.41	0.19

The sample of NASDAQ listed IT firms returned an average debt ratio of 36.09% for the 2010 – 2014 period with a median of 35.88%. The information contained in Table 4.25 is presented in a standard frequency distribution as per Figure 4.21.

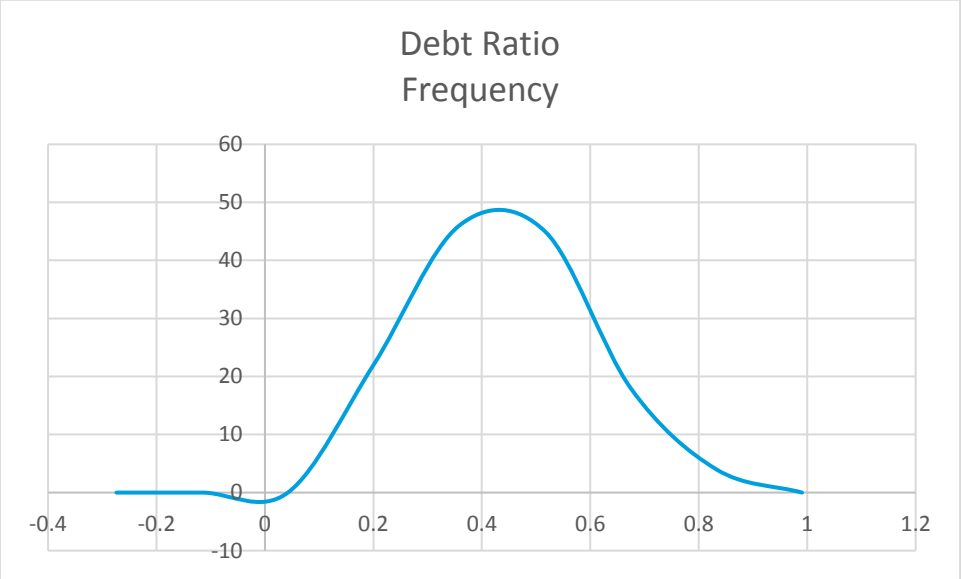

Figure 4.21: NASDAQ listed IT firms Frequency Distribution
Source: compiled by author

The data has a standard deviation of 15.17%; a skewness of 0.281952 and kurtosis of 2.591271. The mean; median and standard deviation of the NASDAQ data are lower than that of the combined sample data. The average trend year on year can be seen in Figure 4.22.

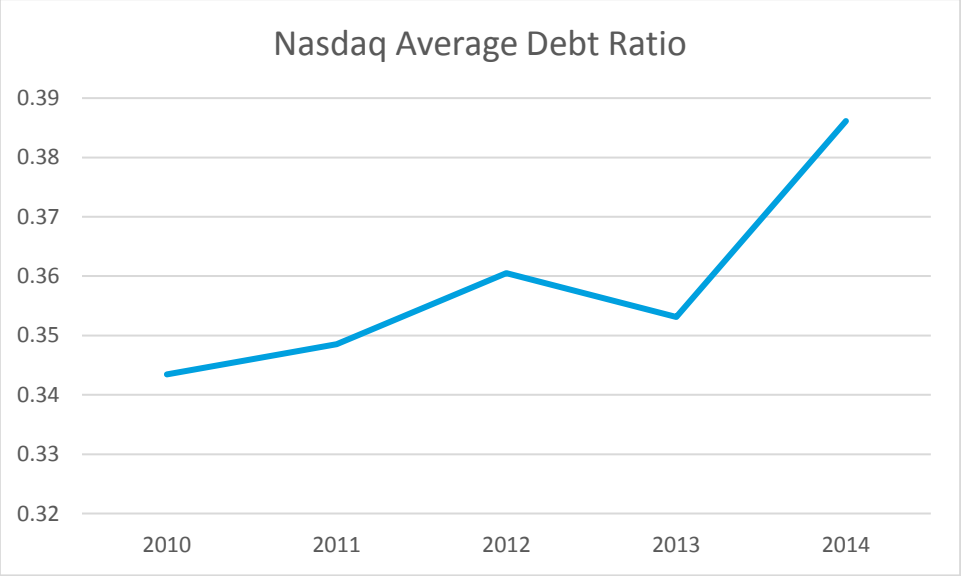

Figure 4.22: NASDAQ listed IT firms Debt Ratio
Source: compiled by author

The data shows an increase in debt ratios from 2010 to 2012, a decline in the average debt ratios are recorded in 2013 followed by a sharp increase in 2014.

4.4.2 Earnings per Share

The year on year EPS information for the NASDAQ sample is presented in Table 4.26.

Table 4.26: Earnings per Share of NASDAQ listed Firms

Year	ADOBE SYSTEMS INC	ALLOT COMMUNICATIONS LTD.	ANSYS INC	APPLE INC.	ASTRO MED INC	AWARE INC
2010	1.52	-0.24	1.68	2.19	0.29	0.01
2011	1.70	0.37	1.96	3.99	0.42	0.13
2012	1.68	-0.21	2.20	6.36	1.47	3.23
2013	0.58	-0.20	2.65	5.82	0.43	0.12
2014	0.54	-0.08	2.77	6.60	0.64	0.20
Year	BOTTOMLINE TECHNOLOGIES INC	BROADVISION INC	CHINA DIGITAL TV HOLDING CO., LTD.	COMMVAULT SYSTEMS, INC	INGRAM MICRO INC	INTERACTIVE INTELLIGENCE GROUP, INC.
2010	0.15	-0.65	2.79	0.48	0.00	0.84
2011	1.06	-1.19	3.42	0.72	1.59	0.78
2012	0.05	-1.08	0.22	1.15	2.04	0.05
2013	-0.38	-1.14	1.77	1.35	2.02	0.47
2014	-0.49	-1.97	0.52	0.57	1.71	-1.96
Year	INTUIT INC	LEXMARK INTERNATIONAL INC	LIVEPERSON INC	LOGMEIN, INC.	MANHATTAN ASSOCIATES INC	MICROSTRATEGY INC
2010	1.83	4.33	0.18	0.89	0.32	5.33
2011	2.09	3.66	0.23	0.24	0.54	2.17
2012	2.70	1.67	0.11	0.14	0.65	2.28
2013	2.89	4.22	-0.07	-0.32	0.88	9.18
2014	3.20	1.29	-0.13	0.33	1.10	0.55
Year	NATIONAL INSTRUMENTS CORP	PROGRESS SOFTWARE CORP	RACKSPACE HOSTING, INC.	RADISYS CORP	ROSETTA STONE INC	SAPIENS INTERNATIONAL CORPORATION N.V.
2010	0.93	0.74	0.37	-0.02	0.64	0.28
2011	0.78	0.93	0.58	-0.04	-0.92	0.27
2012	0.73	0.74	0.77	-1.53	-1.61	0.29
2013	0.64	1.44	0.62	-1.70	-0.74	0.29
2014	0.99	0.99	0.77	-0.76	-3.46	0.30
Year	SMITH MICRO SOFTWARE INC	SYNOPSYS INC	TAKE TWO INTERACTIVE SOFTWARE INC	Mean	Median	Std Dev
2010	0.36	1.60	0.57	1.01	0.57	1.36
2011	-4.46	1.54	-1.22	0.79	0.72	1.68
2012	-0.71	1.22	-0.32	0.90	0.73	1.64
2013	-0.76	1.61	3.69	1.31	0.62	2.32
2014	-0.26	1.66	-3.31	0.46	0.54	1.96

The earnings per share data of the NASDAQ listed firms returned an average of $0.91 per share and a median of $0.60. The information in Table 4.26 can be presented in a frequency distribution as per Figure 25.

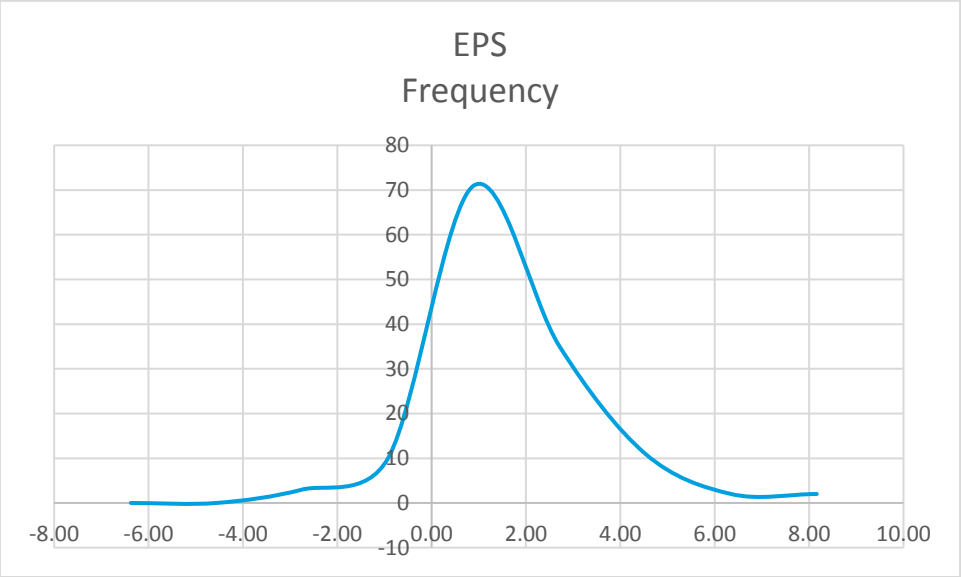

Figure 4.23: NASDAQ listed IT firms EPS frequency distribution
Source: compiled by author

The data has a standard deviation of 1.798926, skewness of 1.239007, and kurtosis of 7.275249. The overall average trend over the period is presented in Figure 4.24.

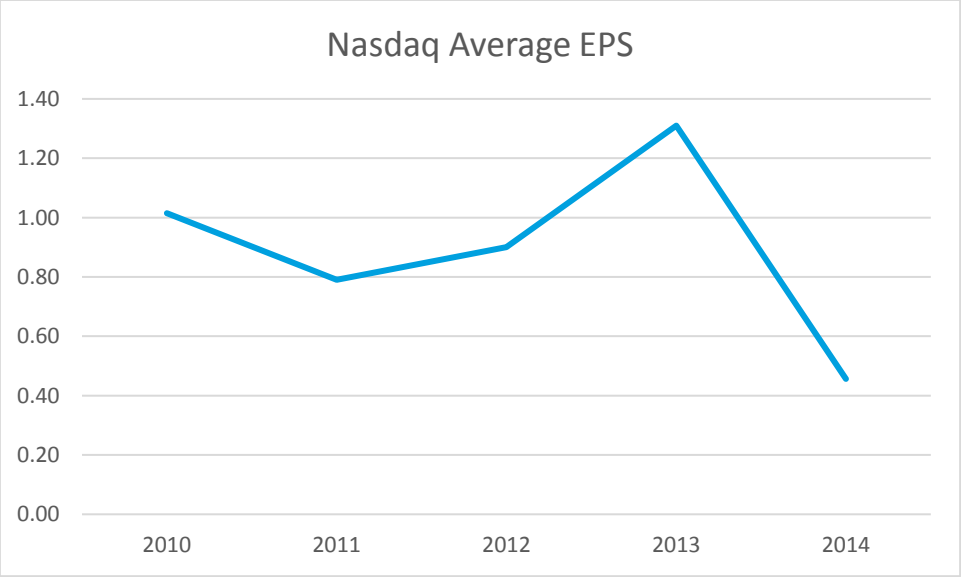

Figure 4.24: NASDAQ listed IT firms Year on Year Average EPS
Source: compiled by author

As can be seen from Figure 4.24, the trend for the period of 2010 – 2014 is erratic with the first year in the sample period showing a decrease in EPS. This is followed by an incline for

two consecutive years and then a drop off in EPS again for the final year of the sample period.

4.4.3 Long Term debt as a percentage of Total Debt

The year on year information collected is presented in Table 4.27.

Table 4.27: Long Term Debt as a Percentage of Total Debt

Year	ADOBE SYSTEMS INC	ALLOT COMMUNICATIONS LTD.	ANSYS INC	APPLE INC.	ASTRO MED INC
2010	0.51	0.00	0.21	0.00	0.00
2011	0.47	0.00	0.08	0.00	0.00
2012	0.44	0.00	0.00	0.00	0.00
2013	0.41	0.00	0.00	0.20	0.02
2014	0.23	0.00	0.00	0.24	0.00
Year	BOTTOMLINE TECHNOLOGIES INC	BROADVISION INC	CHINA DIGITAL TV HOLDING CO., LTD.	COMMVAULT SYSTEMS, INC	INGRAM MICRO INC
2010	0.00	0.00	0.00	0.00	0.09
2011	0.00	0.00	0.00	0.00	0.05
2012	0.00	0.00	0.00	0.00	0.12
2013	0.61	0.00	0.00	0.00	0.10
2014	0.48	0.00	0.00	0.00	0.13
Year	INTUIT INC	LEXMARK INTERNATIONAL INC	LIVEPERSON INC	LOGMEIN, INC.	MANHATTAN ASSOCIATES INC
2010	0.42	0.28	0.00	0.00	0.00
2011	0.20	0.29	0.00	0.00	0.00
2012	0.26	0.13	0.00	0.00	0.00
2013	0.26	0.31	0.00	0.00	0.00
2014	0.24	0.29	0.00	0.00	0.00
Year	NATIONAL INSTRUMENTS CORP	PROGRESS SOFTWARE CORP	RACKSPACE HOSTING, INC.	RADISYS CORP	ROSETTA STONE INC
2010	0.00	0.00	0.22	0.48	0.00
2011	0.00	0.00	0.17	0.34	0.00
2012	0.00	0.00	0.14	0.17	0.00
2013	0.00	0.00	0.06	0.19	0.00
2014	0.00	0.00	0.22	0.00	0.01
Year	SMITH MICRO SOFTWARE INC	SYNOPSYS INC	TAKE TWO INTERACTIVE SOFTWARE INC	SAPIENS INTERNATIONAL CORPORATION	INTERACTIVE INTELLIGENCE GROUP, INC.
2010	0.00	0.00	0.30	0.00	0.00
2011	0.00	0.00	0.57	0.00	0.00
2012	0.00	0.06	0.49	0.00	0.00
2013	0.00	0.05	0.46	0.00	0.00
2014	0.00	0.03	0.28	0.00	0.00
Year	Mean	Median	Std Dev	MICROSTRATEGY INC	AWARE INC
2010	0.09	0.00	0.17	0.00	0.00
2011	0.08	0.00	0.16	0.00	0.00
2012	0.07	0.00	0.13	0.00	0.00
2013	0.10	0.00	0.17	0.00	0.00
2014	0.08	0.00	0.13	0.00	0.00

The data collected for the sample NASDAQ listed IT firms for the period of 2010 – 2014 returned an average of 8.64% and a median of 0%. Table 4.27 is graphically presented in Figure 4.25.

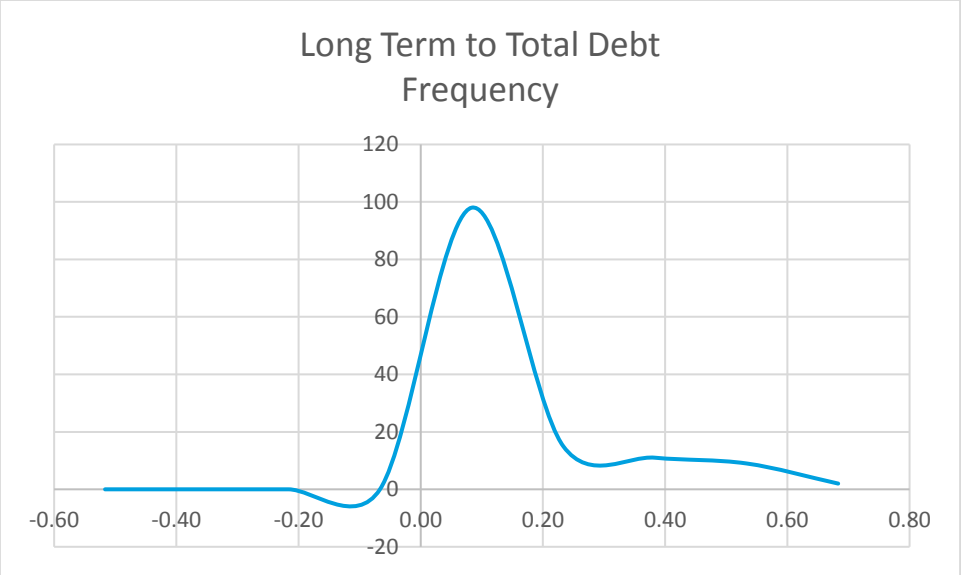

Figure 4.25: NASDAQ listed IT firm's Long Term debt as a percentage of Total Debt Frequency Distribution
Source: compiled by author

The data as presented in Figure 4.25 has a standard deviation of 15.2%; a skewness of 1.739149 and kurtosis of 4.957589. The year on year means are present in a graphical form in Figure 4.26 below:

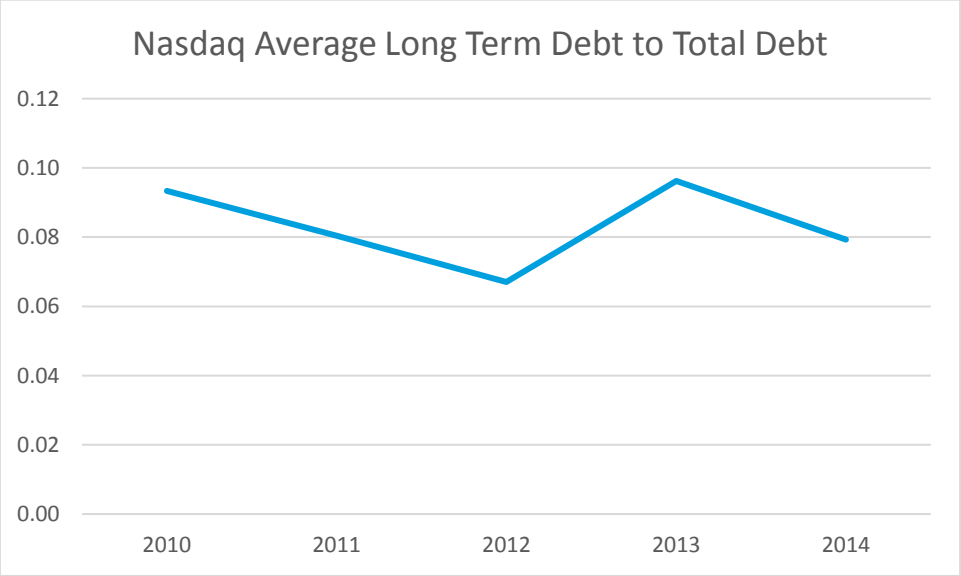

Figure 4.26: NASDAQ listed IT firm's Long Term debt as a percentage of Total Debt
Source: compiled by author

The NASDAQ data again shows a lower mean, median, and standard deviation than that of the combined data sample. The year on year average of the long term debt as a

percentage of total debt returns shows a decline for the period from 2010 – 2012, this is followed by an increase in 2013 with a final decrease in the year 2014.

4.4.4 Return on Equity

The year on year ROE information is presented in Table 4.28.

Table 4.28: Return on Equity

Year	ADOBE SYSTEMS INC	ALLOT COMMUNICATIONS LTD.	ANSYS INC	APPLE INC.	ASTRO MED INC
2010	0.15	-0.09	0.10	0.29	0.04
2011	0.14	0.05	0.10	0.34	0.06
2012	0.12	-0.04	0.10	0.35	0.17
2013	0.04	-0.04	0.11	0.30	0.05
2014	0.04	-0.01	0.11	0.35	0.07
Year	BOTTOMLINE TECHNOLOGIES INC	BROADVISION INC	CHINA DIGITAL TV HOLDING CO., LTD.	COMMVAULT SYSTEMS, INC	INGRAM MICRO INC
2010	0.02	-0.05	0.19	0.11	0.10
2011	0.13	-0.11	0.20	0.14	0.07
2012	0.01	-0.11	0.08	0.15	0.08
2013	-0.04	-0.12	0.22	0.14	0.08
2014	-0.05	-0.27	0.20	0.06	0.06
Year	INTUIT INC	LEXMARK INTERNATIONAL INC	LIVEPERSON INC	LOGMEIN, INC.	MANHATTAN ASSOCIATES INC
2010	0.20	0.24	0.09	0.16	0.15
2011	0.24	0.20	0.09	0.04	0.28
2012	0.29	0.08	0.04	0.02	0.32
2013	0.24	0.19	-0.02	-0.05	0.37
2014	0.29	0.06	-0.04	0.05	0.45
Year	NATIONAL INSTRUMENTS CORP	PROGRESS SOFTWARE CORP	RACKSPACE HOSTING, INC.	RADISYS CORP	ROSETTA STONE INC
2010	0.15	0.07	0.11	0.00	0.07
2011	0.11	0.10	0.13	-0.01	-0.11
2012	0.10	0.07	0.12	-0.35	-0.23
2013	0.08	0.15	0.08	-0.61	-0.12
2014	0.11	0.09	0.10	-0.35	-1.16
Year	SMITH MICRO SOFTWARE INC	SYNOPSYS INC	TAKE TWO INTERACTIVE SOFTWARE INC	SAPIENS INTERNATIONAL CORPORATION	INTERACTIVE INTELLIGENCE GROUP, INC.
2010	0.06	0.11	0.08	0.18	0.15
2011	-2.46	0.11	-0.18	0.05	0.11
2012	-0.60	0.07	-0.05	0.10	0.01
2013	-1.54	0.09	0.45	0.07	0.05
2014	-0.79	0.08	-0.50	0.08	-0.24
Year	Mean	Median	Std Dev	MICROSTRATEGY INC	AWARE INC
2010	0.11	0.11	0.09	0.29	0.00
2011	0.00	0.10	0.50	0.11	0.05
2012	0.07	0.08	0.25	0.10	0.88
2013	0.02	0.08	0.37	0.27	0.03
2014	-0.04	0.06	0.34	0.02	0.09

The average Return on Equity returned for the period of 2010 – 2014 for the sample of NASDAQ listed IT firms is 3.77% and the data has a median point of 8.43%. Table 4.28 is graphically presented as a frequency distribution as per Figure 4.27.

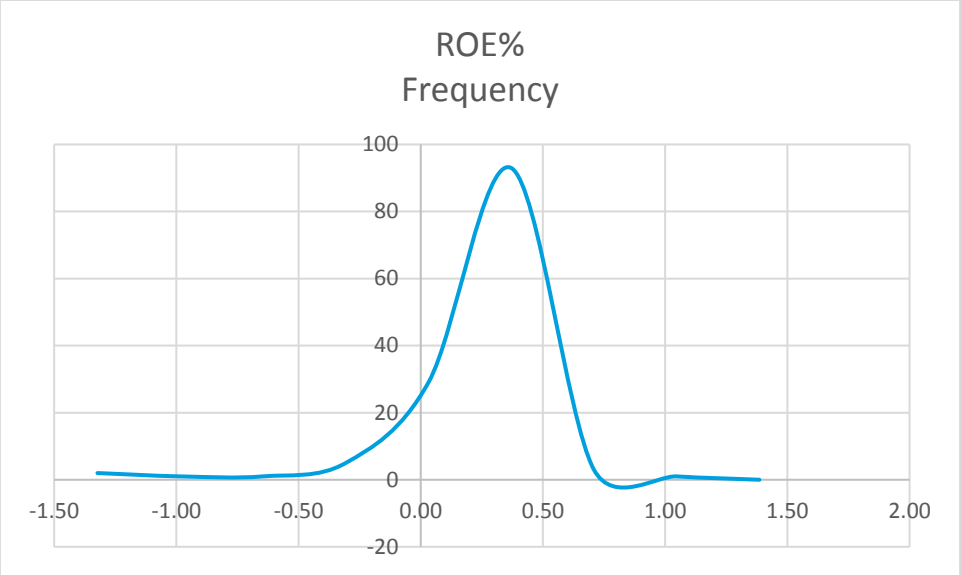

Figure 4.27: NASDAQ listed IT firm's Return on Equity Frequency Distribution
Source: compiled by author

The data has a standard deviation of 52.17%; is negatively skewed with a value of -6.342381 and kurtosis of 63.26759. The Return on Equity mean and median of the NASDAQ data is lower than that of the combined sample and has a higher standard deviation. The year on year movement in mean is depicted in figure 30.

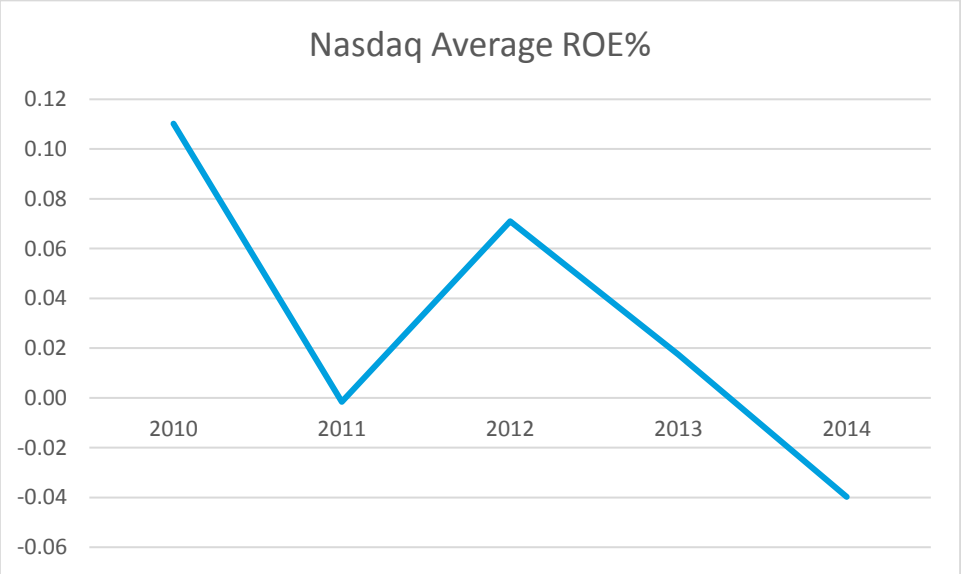

Figure 4.28: NASDAQ listed IT firms' Return on Equity Year on Year Average
Source: compiled by author

The mean year on year varies with a large drop off in value from the year 2010 to 2011 then a climb again for 2012 followed by two consecutive years of declining return on equity.

4.4.5 Times Interest Earned Ratio

The data is presented in Table 4.29, while the year on year averages and frequency distributions are presented as per Figures 4.29 and 4.30, respectively.

Table 4.29: Times Interest Earned Ratio

Year	ADOBE SYSTEMS INC	ALLOT COMMUNICATIONS LTD.	ANSYS INC	APPLE INC.	ASTRO MED INC
2010	17.85	10.32	48.86		0.29
2011	17.88	521.19	79.70	3.99	0.42
2012	17.44	-42.56	110.92	6.36	1.47
2013	6.65	-12.10	275.33	5.82	0.43
2014	7.24	-2.92	0.00	6.60	0.64
Year	BOTTOMLINE TECHNOLOGIES INC	BROADVISION INC	CHINA DIGITAL TV HOLDING CO., LTD.	COMMVAULT SYSTEMS, INC	INGRAM MICRO INC
2010	70.98	8.88	8.56	337.46	12.37
2011	124.91	-4.88	43.25	864.89	8.83
2012	315.65	7.23	5.12	190.45	8.74
2013	-0.92	16.89	-39.96	248.34	9.29
2014	-0.17	-3.73	-6.91	47.20	7.35
Year	INTUIT INC	LEXMARK INTERNATIONAL INC	LIVEPERSON INC	LOGMEIN, INC.	MANHATTAN ASSOCIATES INC
2010	14.82	5.13	135.28	82.76	53.82
2011	18.03	14.59	35.83	5.92	-17.77
2012	23.36	2.54	-33.90	9.37	825.49
2013	40.27	5.13	13.28	-0.13	-154.64
2014	41.94	2.09	-16.05	-82.73	322.65
Year	NATIONAL INSTRUMENTS CORP	PROGRESS SOFTWARE CORP	RACKSPACE HOSTING, INC.	RADISYS CORP	ROSETTA STONE INC
2010	11.37	5.13	6.09	-0.15	-17.31
2011	8.15	6.90	7.44	-0.51	10.10
2012	7.02	5.36	8.14	-18.71	0.58
2013	5.99	10.98	5.81	-28.04	-22.07
2014	8.68	7.04	6.84	-17.14	0.00
Year	SMITH MICRO SOFTWARE INC	SYNOPSYS INC	TAKE TWO INTERACTIVE SOFTWARE INC	SAPIENS INTERNATIONAL CORPORATION	INTERACTIVE INTELLIGENCE GROUP, INC.
2010	0.00	7.21	0.57	11.17	20.39
2011	-51.03	6.57	-1.22	3.84	-150.28
2012	27.53	4.40	-0.32	7.25	5.73
2013	-3.97	5.69	3.69	5.22	6.72
2014	-3.82	5.43	-3.31	6.32	-24.46
Year	Mean	Median	Std Dev	MICROSTRATEGY INC	AWARE INC
2010	19.03	5.20	65.92	11.48	-0.37
2011	63.57	3.99	189.59	3.95	0.00
2012	16.66	1.47	65.45	4.30	-1 088.92
2013	8.80	0.00	57.26	14.23	-231.22
2014	3.37	0.00	16.92	0.90	120.15

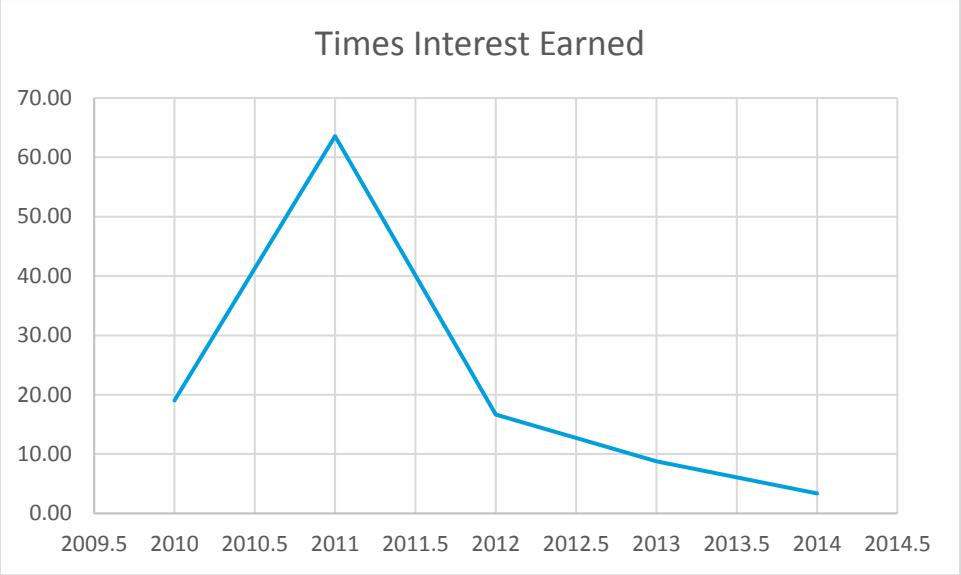

Figure 4.29: NASDAQ listed IT firm's Times Interest Earned Ratio Year on Year Average
Source: compiled by author

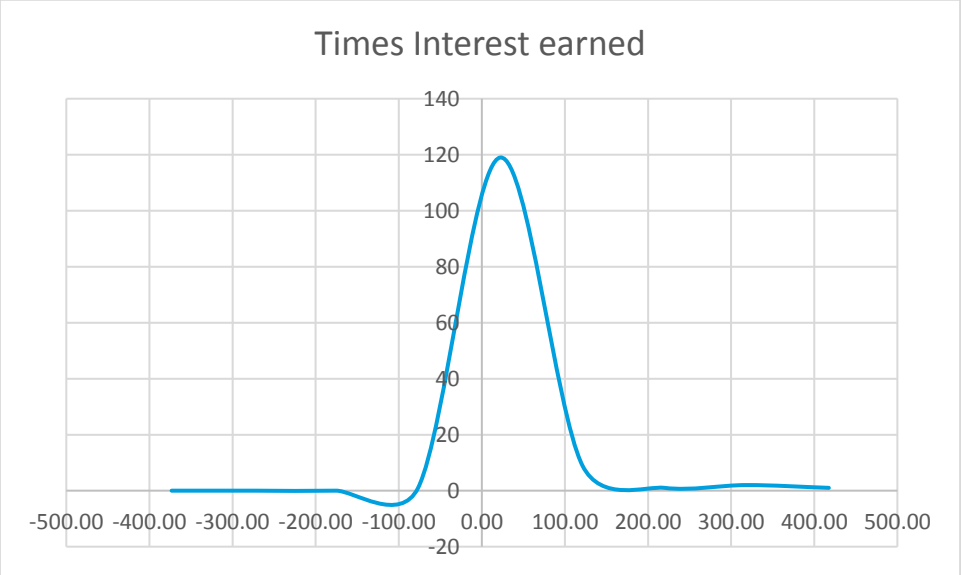

Figure 4.30: NASDAQ listed IT firm's Times Interest Earned Ratio Year on Year Average
Source: compiled by author

The times interest earned ratio for the NASDAQ listed US IT firms returned an average of 26.54013 with a standard deviation of 164.8158. The median for the sample for the period of 2010-2014 was 6.465500. The NASDAQ data has a higher mean and median than that of the combined data sample. The standard deviation of the NASDAQ data is lower than that of the combined data sample.

4.4.6 Return on Assets

The return on assets for the NASDAQ listed US IT companies data is presented as per Table 4.30.

Table 4.30: Return on Assets

Year	ADOBE SYSTEMS INC	ALLOT COMMUNICATIONS LTD.	ANSYS INC	APPLE INC.	ASTRO MED INC
2010	9.52	-6.05	7.20	18.64	0.03
2011	9.26	4.47	7.38	22.28	0.05
2012	8.29	-3.04	7.80	23.70	0.13
2013	2.79	-3.24	9.01	17.89	0.04
2014	2.49	-1.17	9.25	17.04	0.06
Year	BOTTOMLINE TECHNOLOGIES INC	BROADVISION INC	CHINA DIGITAL TV HOLDING CO., LTD.	COMMVAULT SYSTEMS, INC	INGRAM MICRO INC
2010	1.47	-4.23	12.21	6.13	3.50
2011	9.88	-8.83	12.76	7.38	2.67
2012	0.44	-8.73	3.58	8.80	2.67
2013	-2.46	-10.51	16.40	8.48	2.63
2014	-2.73	-22.67	15.02	3.60	2.08
Year	INTUIT INC	LEXMARK INTERNATIONAL INC	LIVEPERSON INC	LOGMEIN, INC.	MANHATTAN ASSOCIATES INC
2010	11.04	9.18	7.06	11.30	10.01
2011	12.41	7.57	7.25	2.48	17.30
2012	16.91	3.05	3.05	1.28	19.81
2013	15.64	7.24	-1.71	-2.75	22.60
2014	17.44	2.17	-3.06	2.50	25.77
Year	NATIONAL INSTRUMENTS CORP	PROGRESS SOFTWARE CORP	RACKSPACE HOSTING, INC.	RADISYS CORP	ROSETTA STONE INC
2010	11.37	5.13	6.09	-0.15	4.81
2011	8.15	6.90	7.44	-0.51	-7.09
2012	7.02	5.36	8.14	-18.71	-12.16
2013	5.99	10.98	5.81	-28.04	-5.55
2014	8.68	7.04	6.84	-17.14	-25.58
Year	SMITH MICRO SOFTWARE INC	SYNOPSYS INC	TAKE TWO INTERACTIVE SOFTWARE INC	SAPIENS INTERNATIONAL CORPORATION	INTERACTIVE INTELLIGENCE GROUP, INC.
2010	0.05	7.21	3.78	11.17	8.46
2011	-2.00	6.57	0.00	3.84	6.36
2012	-0.47	4.40	0.00	7.25	0.32
2013	-0.89	5.69	8.22	5.22	2.69
2014	-0.43	5.43	2.87	6.32	-12.21
Year	Mean	Median	Std Dev	MICROSTRATEGY INC	AWARE INC
2010	6.37	7.06	5.45	11.48	0.34
2011	5.71	6.57	6.50	3.95	4.44
2012	4.85	3.58	20.53	4.30	84.22
2013	0.80	5.22	20.47	14.23	2.91
2014	0.59	2.50	14.41	0.90	8.20

The data has a mean of 2.42%, a median of 5.39%, and a standard deviation of 23.29%.

4.4.7 Asset Tangibility

The data is presented in Table 4.31.

Table 4.31: Asset Tangibility of NASDAQ Sample

Year	ADOBE SYSTEMS INC	ALLOT COMMUNICATIONS LTD.	ANSYS INC	APPLE INC.	ASTRO MED INC
2010	0.49	0.96	0.38	0.99	0.96
2011	0.51	0.98	0.34	0.96	0.99
2012	0.53	0.85	0.39	0.97	0.99
2013	0.48	0.85	0.43	0.97	0.94
2014	0.52	0.87	0.43	0.96	0.95
Year	BOTTOMLINE TECHNOLOGIES INC	BROADVISION INC	CHINA DIGITAL TV HOLDING CO., LTD.	COMMVAULT SYSTEMS, INC	INGRAM MICRO INC
2010	0.65	1.00	1.00	1.00	0.99
2011	0.52	1.00	1.00	1.00	0.99
2012	0.55	1.00	1.00	1.00	0.93
2013	0.67	1.00	1.00	1.00	0.92
2014	0.47	1.00	0.99	1.00	0.93
Year	INTUIT INC	LEXMARK INTERNATIONAL INC	LIVEPERSON INC	LOGMEIN, INC.	MANHATTAN ASSOCIATES INC
2010	0.04	0.05	0.06	0.02	0.03
2011	0.05	0.06	0.05	0.02	0.03
2012	0.05	0.08	0.04	0.02	0.02
2013	0.04	0.07	0.05	0.03	0.02
2014	0.04	0.07	0.06	0.04	0.02
Year	NATIONAL INSTRUMENTS CORP	PROGRESS SOFTWARE CORP	RACKSPACE HOSTING, INC.	RADISYS CORP	ROSETTA STONE INC
2010	0.04	0.04	0.20	0.05	0.02
2011	0.04	0.04	0.19	0.06	0.03
2012	0.05	0.03	0.19	0.22	0.03
2013	0.05	0.02	0.21	0.12	0.03
2014	0.05	0.02	0.23	0.13	0.10
Year	SMITH MICRO SOFTWARE INC	SYNOPSYS INC	TAKE TWO INTERACTIVE SOFTWARE INC	SAPIENS INTERNATIONAL CORPORATION	INTERACTIVE INTELLIGENCE GROUP, INC.
2010	0.05	0.03	-	0.12	0.03
2011	1.54	0.04	-	0.05	0.03
2012	0.08	0.04	-	0.05	0.04
2013	0.13	0.04	-0.10	0.04	0.04
2014	0.11	0.04	-0.03	0.04	0.05
Year	Mean	Median	Std Dev	MICROSTRATEGY INC	AWARE INC
2010	0.34	0.05	0.42	0.03	1.00
2011	0.39	0.06	0.47	0.04	1.00
2012	0.34	0.08	0.40	0.05	1.00
2013	0.34	0.07	0.41	0.05	1.00
2014	0.34	0.10	0.40	0.05	1.00

The asset tangibility of the NASDAQ sample returned an average of 0.381877, a standard deviation of 0.426012, and a median of 0.079839.

4.4.8 Firm Size

The Firm Size data is presented in Table 4.32.

Table 4.32: Firm Size

Year	ADOBE SYSTEMS INC	ALLOT COMMUNICATIONS LTD.	ANSYS INC	APPLE INC.	ASTRO MED INC
2010	23	18	21	18	18
2011	23	19	22	19	18
2012	23	19	22	19	18
2013	23	19	22	19	18
2014	23	19	22	19	18

Year	BOTTOMLINE TECHNOLOGIES INC	BROADVISION INC	CHINA DIGITAL TV HOLDING CO., LTD.	COMMVAULT SYSTEMS, INC	INGRAM MICRO INC
2010	19	18	19	20	23
2011	20	18	20	20	23
2012	20	18	19	20	23
2013	20	18	19	20	23
2014	20	18	19	20	23

Year	INTUIT INC	LEXMARK INTERNATIONAL INC	LIVEPERSON INC	LOGMEIN, INC.	MANHATTAN ASSOCIATES INC
2010	22	22	19	19	19
2011	22	22	19	19	19
2012	22	22	19	19	19
2013	22	22	19	19	20
2014	22	22	19	20	20

Year	NATIONAL INSTRUMENTS CORP	PROGRESS SOFTWARE CORP	RACKSPACE HOSTING, INC.	RADISYS CORP	ROSETTA STONE INC
2010	21	21	20	19	19
2011	21	21	21	20	19
2012	21	21	21	19	19
2013	21	20	21	19	19
2014	21	20	21	19	19

Year	SMITH MICRO SOFTWARE INC	SYNOPSYS INC	TAKE TWO INTERACTIVE SOFTWARE INC	MICROSTRATEGY INC	AWARE INC
2010	19	22	21	20	18
2011	18	22	21	20	18
2012	18	22	21	20	18
2013	17	22	21	20	18
2014	17	22	22	20	18

Year	Mean	Median	Std Dev	SAPIENS INTERNATIONAL CORPORATION	INTERACTIVE INTELLIGENCE GROUP, INC.
2010	20	19	2	18	19
2011	20	20	2	19	19
2012	20	20	2	19	19
2013	20	20	2	19	20
2014	20	20	2	19	20

The firm size for the NASDAQ sample was calculated as detailed in Chapter Three and returned an average of 20.07230, a standard deviation of 1.548945, and a median of 19.61435.

4.4.9 Existence of non-debt tax shields

The existence of non-debt tax shields was tested for in the NASDAQ sample and the data is presented as per Table 4.33.

Table 4.33: Existence of not debt tax shields

Year	ADOBE SYSTEMS INC	ALLOT COMMUNICATIONS LTD.	ANSYS INC	APPLE INC.	ASTRO MED INC
2010	0.03	0.03	0.03	0.01	0.00
2011	0.03	0.01	0.03	0.02	0.00
2012	0.03	0.02	0.03	0.02	0.00
2013	0.03	0.03	0.03	0.03	0.00
2014	0.03	0.02	0.03	0.03	0.00
Year	BOTTOMLINE TECHNOLOGIES INC	BROADVISION INC	CHINA DIGITAL TV HOLDING CO., LTD.	COMMVAULT SYSTEMS, INC	INGRAM MICRO INC
2010	0.07	0.00	0.00	0.01	0.01
2011	0.05	0.00	0.00	0.01	0.01
2012	0.05	0.00	0.01	0.01	0.01
2013	0.05	0.00	0.01	0.01	0.01
2014	0.05	0.00	0.01	0.01	0.01
Year	INTUIT INC	LEXMARK INTERNATIONAL INC	LIVEPERSON INC	LOGMEIN, INC.	MANHATTAN ASSOCIATES INC
2010	0.04	0.05	0.06	0.02	0.03
2011	0.05	0.06	0.05	0.02	0.03
2012	0.05	0.08	0.04	0.02	0.02
2013	0.04	0.07	0.05	0.03	0.02
2014	0.04	0.07	0.06	0.04	0.02
Year	NATIONAL INSTRUMENTS CORP	PROGRESS SOFTWARE CORP	RACKSPACE HOSTING, INC.	RADISYS CORP	ROSETTA STONE INC
2010	0.04	0.04	0.20	0.05	0.02
2011	0.04	0.04	0.19	0.06	0.03
2012	0.05	0.03	0.19	0.22	0.03
2013	0.05	0.02	0.21	0.12	0.03
2014	0.05	0.02	0.23	0.13	0.10
Year	SMITH MICRO SOFTWARE INC	SYNOPSYS INC	TAKE TWO INTERACTIVE SOFTWARE INC	MICROSTRATEGY INC	AWARE INC
2010	0.05	0.03	0.00	0.03	0.01
2011	1.54	0.04	0.00	0.04	0.01
2012	0.08	0.04	0.00	0.05	0.01
2013	0.13	0.04	-0.10	0.05	0.01
2014	0.11	0.04	-0.03	0.05	0.01
Year	Mean	Median	Std Dev	SAPIENS INTERNATIONAL CORPORATION	INTERACTIVE INTELLIGENCE GROUP, INC.
2010	0.04	0.03	0.04	0.12	0.03
2011	0.09	0.03	0.29	0.05	0.03
2012	0.04	0.03	0.05	0.05	0.04
2013	0.04	0.03	0.05	0.04	0.04
2014	0.05	0.04	0.05	0.04	0.05

The data returned an average of 0.051394 for the period 2010-2014, a standard deviation of 0.139694, and a median of 0.032233.

4.4.10 NASDAQ conclusion

The debt ratios of the NASDAQ listed IT firms showed an increase over the period of 2010 to 2014 (with a decline in 2013) as can be seen in Figure 4.22. This has corresponded with an increase in EPS year on year as is represented by Figure 4.24 with the exception of 2014, which shows a sharp decline in earnings per share for the period. The long term debt as a percentage of total debt shows a downward trend over the sample period.

4.5 Panel Root and Cross-section dependence tests

Before the regression analysis was run on the data, panel unit root tests were conducted in order to ascertain whether any of the data contained a unit root. The tests found that on a panel basis both the asset tangibility and the total debt ratios contained a unit root when the common unit root is assumed. Additionally, cross sectional dependence checks were conducted in order to test for cross sectional dependence in the data. Cross sectional dependence (firm correlation) was found for the Times Interest Earned, Earnings per Share, Firm Size, Asset Tangibility and Total Debt Ratios. These findings were catered for in the regression analysis.

The results of the unit root test (common unit root assumed) are presented in Table 4.34 and the cross sectional dependence tests in Table 4.35.

Table 4.34: Panel Unit root test (Common unit root assumed)

Variable	Statistic (Levin, Lin & Chu t*)	P-Value	Number of Cross-sections	Number of Observations	Decision
ROA	-5.88518	0.0000	3	308	No Unit root
AT	0.76309	0.7773	3	306	Unit root
FS	-1.76768	0.0386	3	312	No Unit root
NDTS	-7.62940	0.0000	3	307	No Unit root
DR	-1.46618	0.0713	3	312	Unit root
EPS	-4.62399	0.0000	3	311	No Unit root
LTDTD	-3.95648	0.0000	3	312	No Unit root
ROE	-9.94743	0.0000	3	311	No Unit root
TIE	-9.26943	0.0000	3	298	No Unit root
D(Asset Tangibility)	-21.1635	0.0000	3	305	No Unit root
D(Debt Ratio)	-14.9249	0.0000	3	309	No Unit root

Table 4.35: Cross-section Dependence Test

Variable	Statistic (Breusch-Pagan LM)	P-Value	Decision
ROA	1.887426	0.5961	No cross-section dependence (correlation)
AT	29.80844	0.0000	Cross-section dependence (correlation)
FS	24.93061	0.0000	Cross-section dependence (correlation)
NDTS	1.570044	0.6662	No cross-section dependence (correlation)
DR	13.45746	0.0037	Cross-section dependence (correlation)
EPS	15.34351	0.0015	Cross-section dependence (correlation)
LTDTD	0.709513	0.8710	No cross-section dependence (correlation)
ROE	0.581398	0.9007	No cross-section dependence (correlation)
TIE	17.59909	0.0005	Cross-section dependence (correlation)

4.6 Regression Analysis

The regression analysis was conducted as set out in Chapter Three using the Generalized Methods of Moments (GMM) on both a cross section and period basis set out to answer the following questions:

1. Does a relationship exist between the Total Debt Ratios and Return on Equity? And if so, what is the strength of this relationship?
2. Does a relationship exist between the Long Term Debt to Total Debt Ratio and the Return on Equity Ratio? And if so, what is the strength of this relationship?
3. To what extent (if any) does a relationship exist between the firm's Return on Equity and its Earnings per Share? And if a relationship does exist, what is the strength of the relationship?
4. Does a relationship exist between the Times Interest Earned ratio and the Long Term Debt to Total Debt ratio? And if a relationship does exist, what is the strength of the relationship?
5. Does a relationship exist between the firm's Earnings per Share and its Long Term Debt to Total Debt Ratio? And a relationship does exist, what is the strength thereof?

The period data was used in order to ascertain whether a relationship exists and if so what the strength of the relationship is. The results of the cross sectional analysis were used to supplement the findings of the period regressions and to test if the relationships held true on a cross sectional basis.

Each of the above questions will be discussed in the sections that follow.

4.6.1 Does a relationship exist between the Total Debt Ratio and Return on Equity?

The panel regression analysis for the Total Debt ratio and return on equity ratio was conducted for all three samples. Theoretically, a positive relationship between the total debt ratio and the return on equity ratio was expected. As per Chapter Three, the null hypothesis stated that no relationship exists between the total debt ratio and ROE. Tables

4.36 and 4.37 present the findings of the period and cross sectional weighted GMM method.

Table 4.36: Panel GMM (Period Weights) Dependent

Panel GMM (Period Weights) Dependent Variable: ROE
Cross-sections included: 3
Total panel (unbalanced) observations: 315
Instrument specification: C DEBT ROA ASSET NOND FS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.096849	3.96E-05	2442.623	0.0000
DEBT*FS*ROA*ASSET*NOND	0.145057	3.46E-05	4194.468	0.0000
Effects Specification				
Period fixed (dummy variables)				
Weighted Statistics				
R-squared	0.996642	Mean dependent var		1.908018
Adjusted R-squared	0.994109	S.D. dependent var		12.73071
S.E. of regression	0.356993	Sum squared resid		22.81254
Durbin-Watson stat	0.870535	J-statistic		4.545798
Instrument rank	140	Prob(J-statistic)		0.337151
Unweighted Statistics				
R-squared	0.574584	Mean dependent var		0.094870
Sum squared resid	22.80841	Durbin-Watson stat		1.254449

Table 4.37: Panel GMM (Cross-section weights) dependent variable: ROE

Dependent Variable: ROE
Method: Panel GMM EGLS (Cross-section weights)
Cross-sections included: 3
Total panel (unbalanced) observations: 315
Instrument specification: C DEBT ROA ASSET NOND FS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.097185	0.014130	6.878078	0.0000
DEBT*FS*ROA*ASSET*NOND	0.169799	0.017255	9.840305	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
Weighted Statistics				
R-squared	0.263850	Mean dependent var		0.121428
Adjusted R-squared	0.256749	S.D. dependent var		0.451800
S.E. of regression	0.383236	Sum squared resid		45.67647
Durbin-Watson stat	1.196528	J-statistic		19.89242
Instrument rank	8	Prob(J-statistic)		0.000524
Unweighted Statistics				
R-squared	0.148755	Mean dependent var		0.094870
Sum squared resid	45.63903	Durbin-Watson stat		1.305567

The GMM regression returned a p-value of 0.0000, a coefficient of 0.145057 and adjusted R squared of 0.994109. The null hypothesis is rejected and the alternative is accepted that a positive relationship exists between a firms total debt ratio and its ROE. Cross sectional analysis was used to ensure that these results held true across the three samples, the GMM regression returned a p-value of 0.0000 and a positive coefficient of 0.169799, indicating that the positive relationship holds true at the individual sample levels.

4.6.2 Does a relationship exist between the Long Term Debt to Total Debt Ratio and Return on Equity?

In running the regression analysis, a positive relationship between the firm's return on equity and the long term debt to total debt ratio was expected. The GMM method returned a p-value of 0.0000 and a coefficient of 0.056191. Despite the finding at the period weighted level when the same test is applied using the cross sectional weighting the null hypothesis is accepted as a p-value of 0.1971 is obtained, indicating that no linear relationship exists at the sample level. The regression analysis results can be found in Tables 4.38 and 4.39 below.

Table 4.38: Panel GMM (Period Weights) Dependent variable: ROE

Variable: ROE
Periods included: 135
Cross-sections included: 3
Total panel (unbalanced) observations: 315
Period SUR instrument weighting matrix
Linear estimation after one-step weighting matrix
Instrument specification: C ROA ASSET NOND LTL FS
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.092733	0.000303	305.7562	0.0000
LTL*FS*ROA*ASSET*NOND	0.056191	0.001070	52.52892	0.0000

Effects Specification
Period fixed (dummy variables)

Weighted Statistics			
R-squared	0.905523	Mean dependent var	1.057671
Adjusted R-squared	0.834270	S.D. dependent var	4.276780
S.E. of regression	0.382857	Sum squared resid	26.23775
Durbin-Watson stat	0.805710	J-statistic	4.433024
Instrument rank	140	Prob(J-statistic)	0.350563

Unweighted Statistics			
R-squared	0.510335	Mean dependent var	0.094870
Sum squared resid	26.25309	Durbin-Watson stat	1.170077

Table 4.39: Panel GMM Dependent Variable: Return on equity

Method: Panel GMM EGLS (Cross-section weights)
Periods included: 135
Cross-sections included: 3
Total panel (unbalanced) observations: 315
2SLS instrument weighting matrix
Linear estimation after one-step weighting matrix
Instrument specification: C ROA ASSET NOND LTL FS
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.089348	0.016788	5.322225	0.0000
LTL*FS*ROA*ASSET*NOND	0.150284	0.116269	1.292555	0.1971

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.022146	Mean dependent var	0.124296
Adjusted R-squared	0.012713	S.D. dependent var	0.427873
S.E. of regression	0.413085	Sum squared resid	53.06882
Durbin-Watson stat	1.250947	J-statistic	58.98059
Instrument rank	8	Prob(J-statistic)	0.000000

Unweighted Statistics			
R-squared	0.003000	Mean dependent var	0.094870
Sum squared resid	53.45355	Durbin-Watson stat	1.324923

4.6.3 Does a relationship exist between the Earnings per Share and Return on Equity?

The findings of the GMM period and cross sectional weightings are presented in Tables 4.40 and 4.41 below.

Table 4.40: Panel GMM (Period Weights): Dependent Variable: EPS

Method: Panel GMM EGLS (Period weights)
Cross-sections included: 3
Total panel (unbalanced) observations: 315
Period SUR instrument weighting matrix
Linear estimation after one-step weighting matrix
Instrument specification: C ROA ASSET NOND FS ROE
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	493.8301	3.969482	124.4067	0.0000
ROE*FS*ROA*ASSET*NOND	-11.28590	1.850617	-6.098455	0.0000

Effects Specification

Period fixed (dummy variables)

Weighted Statistics

R-squared	0.445536	Mean dependent var	676.3347
Adjusted R-squared	0.027365	S.D. dependent var	858.5651
S.E. of regression	1072.017	Sum squared resid	2.06E+08
Durbin-Watson stat	0.449882	J-statistic	5.391727
Instrument rank	140	Prob(J-statistic)	0.249412

Unweighted Statistics

R-squared	0.318434	Mean dependent var	485.3588
Sum squared resid	2.06E+08	Durbin-Watson stat	0.355973

Table 4.41: Panel GMM (Cross Section weights) Dependent Variable: EPS

Method: Panel GMM EGLS (Cross-section weights)
Cross-sections included: 3
Total panel (unbalanced) observations: 315
2SLS instrument weighting matrix
Linear estimation after one-step weighting matrix
Instrument specification: C ROA ASSET NOND FS ROE
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	485.3836	0.297315	1632.559	0.0000
ROE*FS*ROA*ASSET*NOND	-0.033941	0.009585	-3.541014	0.0005

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.424567	Mean dependent var	419.7439
Adjusted R-squared	0.419016	S.D. dependent var	708.2943
S.E. of regression	626.2376	Sum squared resid	1.22E+08
Durbin-Watson stat	0.556802	J-statistic	2.451204
Instrument rank	8	Prob(J-statistic)	0.653394

Unweighted Statistics

R-squared	0.296328	Mean dependent var	485.3588
Sum squared resid	2.12E+08	Durbin-Watson stat	0.570884

In conducting this regression analysis, a strong positive relationship between the firm's earnings per share and the return on equity was expected. The GMM method returned a p-value of 0.0000 with a coefficient of -11.28590 indicating a strong negative relationship between a firms ROE and EPS with an adjusted R-squared of 0.027365. GMM using a cross sectional weighting returned a p-value of 0.0005 and a coefficient of -0.033941 supporting the finding that a significant negative relationship exists between a firm's ROE and EPS at an individual sample level.

4.6.4 Does a relationship exist between the Times Interest Earned Ratio and the Long Term Debt to Total Debt Ratio?

The findings of the GMM method are presented in Tables 4.42 and 4.43 below:

Table 4.42: Panel GMM (Period Weights) Dependent Variable: ICR

Method: Panel Generalized Method of Moments
Date: 05/10/18 Time: 14:37
Sample: 1 315
Periods included: 135
Cross-sections included: 3
Total panel (unbalanced) observations: 310
Period SUR instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: C ROA ASSET NOND LTL FS
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	50.39809	31.06809	1.622182	0.1066
LTL*FS*ROA*ASSET*NOND	-129.6110	111.9347	-1.157917	0.2485
Effects Specification				
Period fixed (dummy variables)				
R-squared	0.426252	Mean dependent var		45.70665
Adjusted R-squared	-0.018897	S.D. dependent var		345.4171
S.E. of regression	348.6656	Sum squared resid		21152776
Durbin-Watson stat	1.136885	J-statistic		5.474235
Instrument rank	140	Prob(J-statistic)		0.242004

Table 4.43: Panel GMM EGLS (Cross-section weights) Dependent Variable: ICR

Sample: 1 315
Periods included: 135
Cross-sections included: 3
Total panel (unbalanced) observations: 310
2SLS instrument weighting matrix
Linear estimation after one-step weighting matrix
White cross-section standard errors & covariance (no d.f. correction)
Instrument specification: C ROA ASSET NOND LTL FS
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	45.42678	2.694906	16.85653	0.0000
LTL*FS*ROA*ASSET*NOND	7.496400	2.224092	3.370545	0.0008

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.019678	Mean dependent var	102.0552
Adjusted R-squared	0.010067	S.D. dependent var	343.9981
S.E. of regression	340.4264	Sum squared resid	35462383
Durbin-Watson stat	1.242058	J-statistic	17.46347
Instrument rank	8	Prob(J-statistic)	0.001571

Unweighted Statistics			
R-squared	0.031868	Mean dependent var	45.70665
Sum squared resid	35692822	Durbin-Watson stat	1.227123

Based on the trade-off and optimal capital structure theories discussed in Chapter Two, a positive relationship between the times interest earned and long term debt to total debt ratios was expected. The period weighted GMM regression accepts the null hypothesis with a p-value of 0.2485 and an adjusted R squared of -0.018897., there is no relationship between the firm's times interest earned ratio and its long term debt to total debt ratio.

4.6.5 Does a relationship exist between the firm's Earnings per Share and its Long Term Debt to Total Debt Ratio?

The findings of the regression analysis are presented in Tables 4.44 and 4.45 below.

Table 4.44: Panel GMM (Period Weighting) Dependent Variable: EPS

Method: Panel GMM EGLS (Period weights)
Cross-sections included: 3
Total panel (unbalanced) observations: 315
Period SUR instrument weighting matrix
Linear estimation after one-step weighting matrix
Instrument specification: C ROA ASSET NOND LTL FS
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	472.7217	0.927362	509.7487	0.0000
LTL*FS*ROA*ASSET*NOND	344.1053	0.792647	434.1216	0.0000

Effects Specification
Period fixed (dummy variables)

Weighted Statistics			
R-squared	0.590837	Mean dependent var	671.9274
Adjusted R-squared	0.282251	S.D. dependent var	1052.914
S.E. of regression	1051.513	Sum squared resid	1.98E+08
Durbin-Watson stat	0.443593	J-statistic	5.937435
Instrument rank	140	Prob(J-statistic)	0.203870

Unweighted Statistics			
R-squared	0.344345	Mean dependent var	485.3588
Sum squared resid	1.98E+08	Durbin-Watson stat	0.353889

Table 4.45: Panel GMM (Cross Section Weighting) Dependent Variable: EPS

Method: Panel GMM EGLS (Cross-section weights)
Cross-sections included: 3
Total panel (unbalanced) observations: 315
2SLS instrument weighting matrix
Linear estimation after one-step weighting matrix
Instrument specification: C ROA ASSET NOND LTL FS
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	469.4371	4.732512	99.19407	0.0000
LTL*FS*ROA*ASSET*NOND	433.3694	131.1924	3.303311	0.0011

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.102249	Mean dependent var	580.6973
Adjusted R-squared	0.093589	S.D. dependent var	838.5090
S.E. of regression	936.6094	Sum squared resid	2.73E+08
Durbin-Watson stat	0.874134	J-statistic	17.29561
Instrument rank	8	Prob(J-statistic)	0.001693

Unweighted Statistics			
R-squared	0.288709	Mean dependent var	485.3588
Sum squared resid	2.15E+08	Durbin-Watson stat	0.612492

In preparing the regressions for the EPS to long term debt to total debt ratio, a positive relationship was expected between the two variables. The findings of the GMM method returned a p-value of 0.0000 and a coefficient of 344.1053 and an adjusted R-squared of 0.282251. The null hypothesis was rejected in favour of the alternate hypothesis stating that a relationship does exist between the two variables. This finding is supported by the cross sectional weightings of the GMM regression with a p-value of 0.0011 and a coefficient of 433.6994. As per the cross sectional weighting regression, the relationship between the two variables exists at the sample level.

4.7 Conclusion

From the descriptive statistics data presented above, it is clear that IT firms employ, on average, a different capital structure from those of other firms (as evidenced in the difference between the capital structures of the JSE listed South African IT firms and those of the JSE Top40). The differences in these structures will be discussed in further detail in Chapter five. The section will conclude with a summary of the findings in relation to the five questions that were raised in Chapter Three.

Chapter Five: Summary and Recommendations

This research set to investigate the capital structures employed by JSE listed South African IT firms and to compare this to the capital structures employed NASDAQ listed US IT firms in a comparative study, with the following specific objectives:

- To determine how the capital structure of JSE listed South African IT firms relate to the capital structures of all non IT firms (excluding financial services) in the JSE Top 40.
- To determine how the capital structures of JSE listed South African IT firms relate to those of a sample of US IT firms listed on the NASDAQ.
- To determine if the capital structures of the samples firms and the Return on Equity have a relationship.
- To determine if the composition of the debt of the firm when split between long term debt and short term debt make a difference to the effect on the firm's Return on Equity.
- To determine the relationship between capital structure and EPS in JSE listed South African IT firms.

In order to achieve the above objectives, the study made use of the Generalised Methods of Moments panel regression analysis method applied across data from 3 separate samples across the period of 2009 – 2014 to answer the following questions:

1. Does a relationship exist between the Total Debt Ratio and Return on Equity? And if so, what is the strength of this relationship?
2. Does a relationship exist between the Long Term Debt to Total Debt ratio and the Return on Equity Ratio? And if so, what is the strength of this relationship?
3. To what extent (if any) does a relationship exist between the firm's Return on Equity and its Earnings per Share? And if a relationship does exist, what is the strength of the relationship?
4. Does a relationship exist between the Times Interest Earned Ratio and the Long Term Debt to Total Debt ratio? And if a relationship does exist, what is the strength of the relationship?

5. Does a relationship exist between the firm's Earnings per Share and its Long Term Debt to Total Debt Ratio? And if a relationship does exist, what is the strength thereof?

The findings of the study, contributions, further areas of research and conclusions are presented in the sections which follow.

5.1 Summary of Findings

Prior research was conducted on the South African listed market by Matemilola, Bany-Ariffin and Azman-Saini (2012) who studied the effect of capital structure on firm performance for JSE Top40 firms (excluding financial services). Their findings were supported by Fosu (2013) who examined the effect of capital structure on 257 firms incorporated in South Africa. This study was the first to investigate the capital structures of JSE listed South African IT firms; no prior research exists (to the best of the researchers knowledge) on the capital structures of JSE listed South African IT firms. In order to establish a benchmark, the study compared the capital structures of JSE listed South African IT firms to the capital structures of the JSE Top40 (excluding financial firms) for the period of 2009 to 2014. This research found that JSE listed South African IT firms on average employed more debt than their JSE Top40 counterparts. The study also found a difference in the debt profiles between the two samples and can be summarised as that: although JSE listed South African IT firms employ more debt than the JSE Top40 (excluding financial services), JSE listed South African IT firms typically use less long term debt as a percentage of total debt than JSE Top40 firms (excluding financial services) do.

Each comparison will be discussed in more detail in sections 5.1.1, 5.1.2 and 5.1.3.

5.1.1 Comparison of JSE Listed IT firms and the JSE Top40 (Excluding financial services)

Comparing the average capital structures of JSE listed South African IT firms and those of the JSE Top40 (excluding financial services) shows that South African IT firms employ a different capital structure than that employed by the South African market as a whole. JSE listed South African IT firms on average employ a debt ratio of 63% in comparison to the

42% employed by the JSE listed Top40 (excluding financial services), meaning that on average JSE listed South African IT firms employ more debt in their capital structures than that of their non IT counterparts.

When investigating the debt ratio further we find that only 9.91% of debt employed by JSE listed South African IT firms relates to long term debt, this is 29 percentage points lower than the average long term debt ratios employed by the JSE Top40 (excluding financial services), who on average have a long term debt to total debt ratio of 39%. The difference in the Debt and Long Term debt as a percentage of Total Debt ratios show that although the JSE listed South African IT firm's use more debt in their capital structure, only a small percentage of this debt is long term. Meaning that on average JSE listed South African IT firms prefer to fund their operations out of current liabilities, which represents a difference in behaviour from the JSE Top40 (excluding financial services) sample. The findings tend to support the Pecking Order theory in that JSE listed South African IT companies employ more short term debt than long term debt (Shyam-Sunder and Myers 1999) (Myers, 2001).

Comparing the average Return on Equity for both JSE listed South African IT firms and those of the JSE Top40 shows little difference with the IT firms having an average Return on Equity of 13.83% in comparison to the 14% average Return on Equity of the JSE Top40. However, when comparing the average Earnings per Share of the JSE listed South African IT firms with those of the JSE listed Top40 a large variance can be seen. On average the JSE listed South African IT firms returned an EPS figure of R95.91 per share per annum for the period of 2010 – 2014 while the JSE Top40 returned an average EPS per share per annum of R1 099.64. A preliminary study of the descriptive statistics of the data indicates that the difference in EPS does show (while keeping in mind that the ROE percentage of both JSE listed South African IT firms and that of the JSE listed Top40 are both around the 14% mark) is that the difference in capital structures is translating into a greater portion of the earnings being available for dividends to common shareholders. The fact that EPS for the JSE Top40 are on average higher than that of the JSE listed South African IT firms supports the Static Trade Off theory as proposed by Myers (1984) and the findings of Chipeta, Wolmarans and Vermaak, 2012.

5.1.2 Comparison of JSE listed South African IT firms and NASDAQ listed IT firms

Comparing the capital structures of JSE listed South African IT firms to that of their NASDAQ listed American counterparts shows a difference in the debt ratios employed by each respective geographical location. The JSE listed South African IT firms have an average debt ratio of 63% over the 5 year period in comparison to a debt ratio of 36% for the NASDAQ listed IT firms. This showing a difference in the capital structures employed by the two groups of firms in two different geographical locations. The difference in capital structures employed across the different geographies supports Rajan and Zingales (1995). When investigating the composition of the debt ratio further we find the JSE listed South African IT firms have a Long Term Debt to Total Debt ratio of 9.91% in comparison to the 8% employed by NASDAQ listed IT firms. The descriptive statistics indicate that JSE listed South African IT firms employ a higher debt ratio than their NASDAQ listed counterpart do, and again using comparatively less long term debt than their NASDAQ listed counterparts.

Comparing the Return on Equity of the JSE listed South African IT firms to that of the NASDAQ listed IT firms shows that there is a difference in return on equity, with the JSE listed South African IT firms having a higher return on equity average of 13.83% in relation to the 3% average of the NASDAQ listed firms. When comparing the earnings per share the JSE listed South African IT firms show an average of R95.91 over the period, this is better than the $0.89 (at a nominal exchange rate of R12 to the USD) average for the NASDAQ listed IT firms.

The shows that despite both firms operating in the same industry (although, in different geographic locations), different capital structures are employed. The JSE listed South African IT firms employ, on average, a higher debt ratio with a comparatively lower long term debt to total debt ratio than that of the NASDAQ listed IT firms. The relationships between ROE, EPS and the differing capital structures will be investigated further in the regression analysis.

5.1.3 Summary of findings

The purpose of the analysis of the data was to determine if relationships existed between various ratios as listed in Chapter Three. The first relationship tested was whether a relationship exists between the firm's total debt ratio and its return on equity.

The Pearson Moment Correlation test indicated that no linear relationship exists between the firm's total debt ratio and its return on equity. The Spearman Rank-Order test indicated a positive nonlinear relationship of 18.5% between the two variables. The regression analysis confirmed that a positive relationship of 14.5% does exist between the total debt ratio and the firm's return on equity at both the period weighted and cross sectional weighted levels.

The relationship between the long term debt to total debt and the firm's return on equity was also tested, the Pearson moment correlation test indicated that no linear relationship exists between the two variables. The Spearman Rank-order also returned a result of no relationship while the regression analysis (at both the period weight) returned a small positive relationship of 5.62%, this finding was, however, not supported by the cross section weighted GMM which accepted the null hypothesis that no relationship exists between the variables.

The third set of variables that was tested was that of the firm's return on equity and the firm's earnings per share. The Pearson Moment Correlation test indicated a positive linear relationship of 23.4% between the two variables. Applying the Spearman Rank-order test returned a significant positive relationship of 54% between the firm's return on equity and the earnings per share. These results were in line with the theoretically expected outcomes of the test. When running the regression to test the relationship between the return on equity and the firm's earnings per share a significant negative relationship was found between the two variables at both the period and cross section weights with adjusted R-squared figures of 0.027365 and 0.419016 respectively. Given the low adjusted R-squared values further study would be needed into the relationship between the firm's return on equity and the firm's earnings per share.

The fourth test conducted tested the relationship between the firms Times Interest Earned ratio and the firms long term debt to total debt ratios. The Pearson Moment correlation test showed no linear correlation between the variables while the Spearman Rank-Order showed a negative monotonic relationship of 11.8%. Testing the relationship between the two variables using the GMM regression method confirmed that no relationship exists at both the period and cross section weights for the sample. The regression analysis returned a negative adjusted R-squared value, further study is needed to understand the results of the regression analysis for the times interest earned to long term debt to total debt ratio.

The final correlation test conducted was to test the relationship between the long term debt to total debt ratio to earnings per share. The Pearson Moments Correlation indicated a positive relationship of 29% for the sample, using the Spearman Rank-order correlation test confirmed a positive relationship between the two variables. The regression analysis finds that a significant positive relationship exists between the firm's long term debt to total debt ratio and the firm's earnings per share at both the cross section and period weights.

5.1.4 Conclusion

The regression analysis sought to answer five questions regarding the effects of capital structure on a firm's ROE. The results have confirmed:

1) That a positive relationship does exist between a firm's return on equity and total debt ratios.
2) A positive relationship does exist between the firm's return on equity and its long term debt to total debt ratios.
3) A negative relationship exists between the firm's return on equity and its earnings per share. Given the low adjusted R-squared (0.027365) further study is needed to fully understand the relationship between the two variables.

4) No relationship exists between the firm's times interest earned ratio and its long term debt to total debt ratio. Given the adjusted R-squared of -0.018897 further study is needed to understand the relationship between the two variables.
5) Despite a low adjusted R-squared of 0.282251, a positive relationship exists between the firm's earnings per share and its long term debt to total debt ratios.

Based on the descriptive statistical analysis that was conducted the study found that that differences in capital structure and return on equity figures were recorded for the JSE listed South African IT firms and JSE Top40 (excluding financial) services. When comparing the mean return on equity figures for JSE listed South African IT firms to those of the JSE Top40 (excluding financial services) the study found a slightly lower mean ROE for JSE listed South African IT firms of 13.83% in comparison to the 14.38% ROE of JSE Top40 firms (excluding financial services).

When comparing the capital structures of JSE listed South African IT firms to those of the NASDAQ listed US IT firms the study revealed that the South African firms on average employ a higher total debt ratio by a margin of 27%. However, a similarity in the long term debt ratios was found in that both JSE listed South African IT firms and NASDAQ listed US IT firms employ a small long term debt as a percentage of total debt with the NASDAQ listed US IT firms employing a long term debt as a percentage of total debt ratio of 8.64% and the JSE listed South African IT firms a ratio of 9.91%. The descriptive statistics indicate that although JSE listed South African IT firms employ more total debt than their NASDAQ listed US counterparts, firms in both geographies use a small long term debt as a percentage of total debt ratio.

To further understand and explain the differences recorded in the descriptive statistical analysis of the three samples, a regression analysis was conducted to provide answers to the five questions that were raised in Chapter Three. The results of the regression analysis (in answering the previously raised questions) are as follows:

1. Does a relationship exist between the Total Debt Ratios and Return on Equity? And if so what is the strength of this relationship?
    a. A positive correlation of 14.5% (with an adjusted R-squared of 0.994109) exists between the Total Debt and Return on Equity ratios.
    b. The findings of the regression analysis support those of Fosu (2013) who found that a strong non-linear relationship exists between the firm's capital structure and performance. (Despite a difference in the definition of "firm performance" between this study that of Fosu (2013). This study made use of return on equity to measure the firm's performance and how the performance impacted on wealth maximisation for the shareholder while Fosu (2013) made use of return on assets to measure the firm's performance.)

2. Does a relationship exist between the Long Term Debt to Total Debt ratio and the Return on Equity Ratio? And if so what is the strength of this relationship?
    a. A positive correlation of 5.62% (with an adjusted R-squared of 0.834270) exists.
    b. The study supports the findings of Matemilola, Bany-Ariffin and Azman-Saini (2012) who found evidence of a positive relationship between long term debt to total debt and the firm's return on equity in the JSE Top40 (excluding financial services).

3. To what extent (if any) does a relationship exist between the firm's Return on Equity and its Earnings per Share? And if a relationship does exist, what is the strength of the relationship?
    a. A strong negative relationship was found between the firm's Return on Equity and its Earnings per Share, however, the adjusted R-squared was low at 0.027365.
    b. To the best knowledge of the researcher, no previous research has been conducted in the South African market, on the relationship between a firm's return on equity and its earnings per share. As such, there are no prior findings to which this study can be compared.

4. Does a relationship exist between the Times Interest Earned ratio and the Long Term Debt to Total Debt ratio? And if a relationship does exist, what is the strength of the relationship?
    a. The study found that no relationship (with an Adjusted R-squared -0.018897) exists between the firms Times Interest Earned ratio and its Long Term Debt as a percentage of Total Debt ratio.
    b. To the best knowledge of the researcher, no previous research has been conducted, in the South African market, on the relationship between a firm's time interest earned ratio and its long term debt as a percentage of total debt ratio. As such, there are no prior findings to which this study can be compared.

5. Does a relationship exist between the firm's Earnings per Share and its Long Term Debt to Total Debt Ratio? And if a relationship does exist, what is the strength thereof?
    a. A positive relationship of 344.11 (with an adjusted R-squared of 0.282251) does exist between the two ratios.
    b. To the best knowledge of the researcher, no previous research has been conducted, in the South African market, on the relationship between a firm's earnings per share and its long term debt as a percentage of total debt ratio. As such, there are no prior findings to which this study can be compared.

As the return on equity is calculated using the firm's net income after tax divided by the firm's total equity, the positive relationship between the firm's return on equity and its capital structure as found by the regression analysis supports the propositions of Modigliani and Miller (1963). The results of the regression analysis show that with the introduction of debt into the firm's capital structure a tax shield is introduced to the firm's statement of comprehensive income which serves to increase the firm's net income after tax by reducing the firm's tax liability. (This increase to the firm's net income after tax results in an increase in the firm's return on equity). Furthermore, the tax deductibility of

the interest paid on debt (the debt tax shield) serves to lower the firm's after-tax cost of debt. The reduction in the cost of debt, in turn, translates into to a lower weighted average cost of capital for the firm which again translates into a greater firm value by discounting the firm's after-tax cash flows by the lower weighted average cost of capital.

In contrast to the findings of Majumdar and Chhibber (1999), Pushner (1995) and Onaolapo and Kajola (2010), this study revealed that a positive relationship exists between the firm's capital structure and its performance (as measured by the firm's return on equity) and supports the findings of Rajan and Zingales (1995), Nickell, Nicolitsas and Dryden (1997), Nickell and Nicolitsas (1999) who found that a positive relationship between capital structure and firm performance. Similarly, with Lichtenberg and Siegel (1990), Kaplan (1989), Smith (1990) and Denis and Denis (1993) who found an increase in Return on Equity and leveraged buy-outs in the United States of America.

Despite the positive relationship found between the firm's return on equity and its total debt and long term debt as a percentage of total debt ratios, the findings of the Spearman Rank Correlation and Pearson Moment Correlation along with the findings of the regression analysis support the theory that a firm needs to balance the benefits of debt and with potential costs of bankruptcy as put forward by Robichek and Myers (1965), Kraus and Litzenberger (1973) and Bradley, Jarrel, and Kim (1983). The study thus shows support for the trade-off theory as a firm will need to balance the benefits of including debt in its capital structure with the potential costs.

This study supports the findings of Gwatizdo and Ojah (2009) who determined that African firms tend to rely heavily on internal finance and when they use external finance, the firms tend to rely on short-term debt to fund their operations. In contradiction to the static trade-off theory, this study finds evidence that supports the pecking order theory.

Furthermore, the study shows support for Myers' (1977) theory that states that firms that wish to mitigate the underinvestment problem make use of short term debt as this study

finds that JSE listed South African IT firms tend to use more short term debt than long term debt. Although Meyers (1977) states that the introduction of debt into the firm's capital structure can be offset by personal taxes, this does not seem to be the case in South Africa due to the nature of South Africa's tax legislation which caps the tax on distributions to shareholders through dividends at 20% (Haupt, 2018).

Given the low adjusted R-squared values of the regression results for:

- the firms earnings per share to return on equity;
- times interest earned to long term debt to total debt;
- earnings per share to long term debt to total debt;

the study has made no inferences on the population as a result of further study is needed to fully understand the regression results.

5.2 Contributions of the study

This study was the first to test the capital structures of IT firms in South Africa, in particular, the paper set out to research the capital structures of JSE listed South African IT firms and compare these to the capital structures of the JSE Top40 as well as to a sample of NASDAQ listed South African IT firms. Although this study did not address Myers' (1984) question around how firms choose their capital structures it has provided insight into the capital structures employed by JSE listed South African IT firms and how these compare to that of the rest of the South African market, as well as to NASDAQ listed US it firms.

In attempting to achieve the research objectives, a difference was found in the way in which the three different groups of firms are capitalised, in particular, this study contributed to the current body of knowledge as follows:

1) The study was able to find the current capital structures of JSE listed South African firms for the period 2009 to 2014.
2) The study found the average capital structures of the JSE Top40 (excluding financial services) for the period 2009 to 2014.
3) The study found the average capital structures of NASDAQ listed US IT firms for the period 2009 to 2014.

4) The study was able to draw comparisons between the three different samples and found that the JSE listed South African IT firms and JSE Top40 are capitalised differently, in addition to this the study found that although the JSE listed South African IT firms and NASDAQ listed IT firms are capitalised differently, both samples employ a comparatively lower long term debt as a percentage of total debt ratio.
5) The study also tested the correlations of various theoretically accepted relationships in the IT sector, a test which has not been conducted before.

In addition to the above, this study further supplements the findings of Bradley, Jarrell and Kim (1983) whose study did not include the IT industry.

5.3 Suggested Areas for Further Research

Further study is needed in order to explain why the various capital structures have been employed by the three different samples. In particular, further research is needed into the following areas to fully explain the findings of this study:

1. Further research is needed to explain why IT firms (as evidenced in both the NASDAQ and JSE samples) employ low long term debt as a percentage of total debt ratios.

2. Further research needs to be conducted in order to understand if JSE listed South Africa IT firms should raise funding in such a manner so as to adjust towards an optimal capital structure as per the static trade-off theory as presented by Robichek and Myers (1965), or if they should follow a specific order of raising funding such as in the pecking order theory (Myers, 1984).

    a. A combination of the two theories may also be in use as found by Frank and Goyal (2003) Further research into the capital structures may find that South African firms do in fact make use of both theories in practice.

3. Research needs to be conducted into the South African IT market in order to understand the nature of the industry and whether the South African IT industry can be described as a growth industry.

    a. And if the South African IT market can be described as a growth market further research needs to be conducted into whether the results of Lemmon and Zender (2010) who find that growth industries typically use more short term financing and the convert the short term debt into long term debt as the firm matures and growth opportunities decline, hold true.

4. In addition to point three, further qualitative research will need to be conducted to understand why JSE listed South African IT firms on average use more short term debt in their capital structures to fully understand why the firms' choose to use more short term debt than long term debt.

    a. A comparative study can be conducted with NASDAQ listed US firms as the capital structures of NASDAQ listed US firms have similar characteristics to those of the JSE listed South African IT firms. The comparative study expanding on the reasons for the use of more short term debt in the capital structures of IT firms across the two stock exchanges would further explain the extent to which the findings of this study support the theory that firms with growth options will tend to use more short term debt, Myers (1977).

5. Although the study has found that a positive relationship does exist between the firm's capital structure and its return on equity, further research will need to be conducted on the costs of bankruptcy and what effect the capital structure of the firm has on these costs.

6. Further research will need to be conducted to test if debt is used as a measure of control of managers in a South African environment given the difference in ownership structures (and control) in South Africa in relation to the findings of Stulz (1990) and Grossman and Hart (1982).

7. Further study is needed to determine if JSE listed South African IT firms adjust towards an optimal capital structure as is found in other sectors as presented in studies by Elsas and Florysiak (2011), Huang and Ritter (2009), Nunkoo and Boateng (2010), Ramjee and Gwatidzo (2012) and Coricelli, Driffield, Pal and Roland (2011) and again in Moyo, Wolmarans and Brummer (2013) who found support for the trade-off theory in the manufacturing, mining and retail firms listed on the JSE and Chipeta *et al*. (2012) who find that South African listed firms do adjust towards a target optimal structure.

8. This study did not attempt to measure the correlation between the firm's default risk and its return on equity as presented by Vassalou and Xing (2004), Dichev (1998), Campbell, Hilscher, and Szilagyi (2008). This relationship will need to be explored further in a subsequent study.

In addition to the above points, research will need to be conducted into the results of the regression analysis in order to understand the results of questions three and four which deviated from the theoretically expected outcomes. Furthermore, the regression analysis will need adjustments to improve on the findings based on question five, the purposes of the adjustments should be aimed at improving the fit (increasing the adjusted R-squared) of the regression model. Question Five may also benefit from a slight adjustment to the question itself, instead of testing the relationship between the long term debt as a percentage of total debt ratio to earnings per share, the relationship between the firms total debt to earnings per share can be tested instead. Doing so may provide further insight into the capital structures that the firms employ and how these affect the firm's value.

Finding information on the South African IT sector proved challenging, it is recommended that the results of the tests relating to the JSE listed South African IT firms (in particular the total debt and long term debt as a percentage of total debt) be tested on privately owned IT firms.

The capital structures of IT firms based in other geographical locations should be tested against the results of the NASDAQ listed IT firms to test whether the capital structure findings are true across multiple exchanges. In addition, a further test should be run on capital structures between IT firms based in developed countries and those based in developing countries to test the effect of the economy in which the firm operates on the capital structure of the firm.

5.4 Conclusion

The objective of this study was to determine the capital structures of JSE listed South African IT firms and to compare these to the JSE Top40 and NASDAQ Listed US IT firms. In addition to this, the study sought to understand the capital structures employed by making use of the GMM regression analysis method to understand how the various components of the capital structure affected the Return on Equity and Earnings per Share. Although the study was able to determine the average capital structures of the various samples, the findings of the regression analysis for two of the five questions do need further investigation as these deviated from what was theoretically expected.

South African JSE listed IT firms employ more debt in their capital structures than JSE Top40 firms and NASDAQ listed US IT firms, however, tend to employ less long term debt than the JSE Top40 with most of their debt comprising of short term payables. NASDAQ listed US firms tend to follow the same trend as JSE listed South African IT firms in that most of the debt of the NASDAQ sample consists of short term payables.

The positive relationship between the firm's return on equity and its capital structure shareholders have the opportunity to address agency problems inherent in firms where the owners of the firm are not the managers. The shareholders should insist on a level of debt (preferably long term debt) in the firm's capital structure to take advantage of the debt covenants that lenders typically impose on debt. In doing so the shareholders have

an added level of control through the monitoring of the firm that the lender will carry out in accordance with the debt covenants while increasing their return on equity.

In order to maximise shareholder wealth (and thereby achieve their main mandate) managers of JSE listed South African IT firms should look to adjust the firm's capital structure towards a mix of debt and equity which maximises the return on equity and earnings per share for shareholders while correctly managing the costs of debt.

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Investigating the Capital Structure of South African JSE listed IT firms: a National and International Comparative Study.

A. Victor

Research dissertation in fulfilment of the requirements for the degree of Master of Commerce in Finance at the University of South Africa

Promotor:

Professor G. Makina

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A Research dissertation in fulfilment of the requirements for the degree of Master of Commerce in Finance at the University of South Africa by Andrew Victor, student number 4352-539-3, entitled ***'Investigating the Capital Structure of South African JSE listed IT firms: a National and International Comparative Study'*** *was edited by me*

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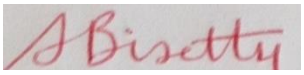

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